WMRC Reports
Waste Management and Research Center

Guidelines and Methods for Conducting Property Transfer Site Histories

Craig E. Colten,
Diane Mulville-Friel
Illinois State Museum

RR-E49
September 1990
Electronic Version

About WMRC's Electronic Publications:

This document was originally published in a traditional format.

It has been transferred to an electronic format to allow faster and broader access to important information and data.

While the Center makes every effort to maintain a level of quality during the transfer from print to digital format, it is possible that minor formatting and typographical inconsistencies will still exist in this document.

Additionally, due to the constraints of the electronic format chosen, page numbering will vary slightly from the original document.

The original, printed version of this document may still be available.

Please contact WMRC for more information:

WMRC
One E. Hazelwood Drive
Champaign, IL 61820
217-333-8940 (phone)

www.wmrc.uiuc.edu

WMRC is a division of the Illinois Department of Natural Resources

HAZARDOUS WASTE RESEARCH & INFORMATION CENTER
One East Hazelwood Drive
Champaign, Illinois 61820
(217)333-8940

HWRIC RR-049

Guidelines and Methods for Conducting Property Transfer Site Histories

by

Craig E. Colten
and
Diane Mulville-Friel

Illinois State Museum
Springfield, Illinois

Printed September 1990
Reprinted May 1991

Illinois Department of Energy and Natural Resources

GUIDELINES AND METHODS FOR CONDUCTING PROPERTY TRANSFER SITE HISTORIES

by

Craig E. Colten
and
Diane Mulville-Friel

Geography Program
Illinois State Museum
Springfield, Illinois 62706

Prepared for
the Illinois Hazardous Waste Research and Information Center
HWRIC Project 90-077

Printed August 1990
Reprinted May 1991

Printed by Authority of the State of Illinois 91/500

This report is part of HWRIC's Research Report Series and as such has been subject to the Center's external scientific peer review. Mention of trade names or commerical products does not constitute endorsement or recommendation for use.

ACKNOWLEDGEMENTS

Essential assistance for this project came from many fronts and we wish to extend our thanks to the individuals and organizations that provided information and guidance.

Several state-wide professional organizations provided us with names of individuals who shared their insight into the workings of property transfers and the attendant site investigations. Practitioners also allowed us time in their busy schedules to pass on their opinions and expertise. Their input forms the core of our evaluation of the property transfer law and for this we are appreciative. We also wish to thank the out-of-state organizations that provided us with copies of their guidelines and also responded to our inquiries. We take credit for any failing or errors that may be included in the report.

Numerous state agencies responded to our requests for information about the type of files they maintain. In particular we are grateful to the Illinois Environmental Protection Agency and the State Fire Marshal for their cooperation. Others, such as the Department of Transportation and the State Geological Survey, commented on their experience with property transfer investigations. The State Library staff, as usual, provided vital assistance in securing publications that were critical to this project.

We also wish to thank staff members who made significant contributions. Tim Osburn showed marvelous dexterity with the desktop publishing equipment while preparing many of the figures. Julie Snider and Ted Samsel drafted the hand-made illustrations. Doug Moore provided valuable assistance with research and Chris Friel, of the Department of Energy and Natural Resources, aided with geographic information system applications and computer illustrations. Claudia Washburn of the Hazardous Waste Research and Information Center did a superb job of keeping the project moving and supplying us with articles on the subject.

Finally, we wish to thank the anonymous reviewers for their comments on an earlier version of this report.

CONTENTS

Figures

ABSTRACT

Recent passage of the Illinois Responsible Property Transfer Act (PA 85-1228) and its amendments (PA 86-679) has sharpened public interest in the environmental liabilities associated with the transfer of real estate. The state law, which became fully effective in 1990, requires individuals involved in certain types of property transactions to file "disclosure documents" with the Illinois Environmental Protection Agency and local county recorders. The purpose of these documents is to "ensure that parties involved in certain real estate transactions are made aware of the existing environmental liabilities associated with ownership of such properties." The intent is to protect the so-called "innocent property buyer" and to encourage remediation of environmental contamination.

Illinois State Museum staff, with support from the Hazardous Waste Research and Information Center, conducted an extensive literature review and a series of personal interviews to:

a. examine the history of hazardous material use in Illinois.
b. determine what the private sector standards were for conducting site history components of site assessments and gauge the initial response to the Illinois Property Transfer Act in the real estate trade.
c. develop guidelines for preparing effective site histories.
d. compile recommendations for possible improvements to the current legislation.

The research suggests that there was more than a century of unregulated use and disposal of hazardous materials in Illinois. Yet, current methods used to compile site histories discount this significant aspect of industrial activity. The private sector is fairly well informed about the new legislation which requires reporting on past land use activities, but they are confused about the specific reporting requirements and feel there was inadequate financial support for the act's implementation. Practitioners report that private sector standards for documenting environmental conditions are much more rigorous than those imposed by the disclosure document, and consequently, the new legislation has not interfered with real estate transactions. The disclosure document, as currently worded, is unlikely to assist in the discovery of contaminated land and cannot be used as a due diligence defense. If the state law is intended to alert innocent property buyers to potential environmental liabilities, there is room for substantial improvement, particularly in terms of the site history. This can be done with minimal burden on the real estate industry by providing support to the agencies that must manage and dispense the records crucial to due diligence investigations.

EXECUTIVE SUMMARY

The Illinois Responsible Property Transfer Act (PA 85-1228, amended by PA 86-679) went into effect in January 1990 and is part of a national legislative movement to provide unknowing property buyers with information about environmental liabilities associated with real estate that they may purchase. The Federal Superfund law imposed liability on the owner for cleaning up property contaminated with hazardous substances. Subsequent amendments to Superfund provided innocent buyers with a means to avoid the potentially devastating costs of remediation. If potential buyers conduct an environmental assessment or review of the property's past uses and show that they exercised "due diligence" prior to acquiring title, they are not culpable.

This report investigates the historical component of due diligence investigations. The purpose is to determine what the evolving standards are and to compare the level of reporting expected in the private sector with the requirements of the Illinois Responsible Property Transfer Act (IRPTA). Although the federal legislation provides the basic definition of due diligence, the private sector is developing practical standards. The intent of due diligence reports developed to satisfy lending institutions is to document environmental conditions and thereby satisfy the "all appropriate inquiry" standard. The intent of the IRPTA disclosure document is also to reveal information about environmental conditions, although it cannot serve as a due diligence defense. Nevertheless, due diligence and the disclosure documents share similar intents, and for this reason, we compared the level of reporting of the two procedures.

Several states have passed legislation or have bills pending that require certain information or clean up procedures to precede the transfer of real estate. Illinois' Responsible Property Transfer Act mandates that individuals selling property that must be reported to the Illinois Environmental Protection Agency (IEPA) under the Community Right-to-Know bill or who have an underground storage tank that is registered with the State Fire Marshal must file a "disclosure document" with the IEPA and the county recorder. The purpose of the disclosure document is to create a record of "environmental defects" that may be passed on to subsequent owners. Yet, the form calls for little investigation into either existing environmental conditions or the history of hazards-related activity at the site.

The industrial history of Illinois and past waste management practices followed in the private sector suggest a much more thorough site investigation is needed. The legacy of hazardous material-handling industry in Illinois extends back more than a century. With rapid conversion of idle industrial property, there is an extreme risk faced by property buyers who rely on the IRPTA to define what properties should be investigated.

A historical survey of industrial waste generation, treatment technologies, and waste management practices indicates potential hazards abound across the state in both rural and urban areas. Activities associated with defunct manufacturing activities seldom appear in the records that sellers, or their consultants, examine in preparing site histories. Furthermore, underground storage tank reporting practices fail to indicate the full number and distribution of inactive and potentially hazardous tanks, the type of material stored in them, or their condition.

A survey of individuals engaged in real estate transactions, employed by lending institutions, and offering environmental consulting services clearly indicated that the Illinois disclosure document does not offer satisfactory information about a site's environmental condition. Furthermore, practitioners reported that a far broader range of sites needed investigations than is called for by the IRPTA and and that information is needed from a longer time span than the owner normally can supply.

National organizations are attempting to establish, through practice, consistent due diligence investigation standards, and there is also draft federal legislation addressing this issue. Currently, there is great inconsistency among their recommendations however. One of the greatest shortcomings is the absence of an understanding of historical records that can greatly aid in preparing site histories and their value as components of site assessments.

There are historical records that can yield much detailed information about past land uses. By ignoring these sources, consultants offering site histories are not, in our opinion, undertaking "all appropriate inquiry." Investigations that require reporting on historical activity should use professionals trained in historical research. This will improve the site assessment documentation and also effectively reduce delays associated with preparation of the historical components of site investigations. The greatest hindrance to efficient site assessment is the inaccessibility of regulatory agency files, not the level of historical information.

We recommend that

1. Improvements in record management, dissemination, and preservation would greatly improve both site history preparation and other components of site assessments.

2. Both IRPTA disclosure documents and site assessments should place a greater reliance on documentary sources.

3. Efforts should be made to strengthen the due diligence standards and also the IRPTA disclosure process.

CHAPTER 1. INTRODUCTION

1.1 Historical Hazards

There is a tremendous "credibility gap" between the number of hazardous material sites inventoried by regulatory agencies and those that actually exist (Greenberg and Anderson, 1984). This fact is gaining increasing significance as unwitting property buyers find themselves holding title to contaminated land. The U.S. Environmental Protection Agency (USEPA) has over 29,000 sites in its computerized inventory, however, the U.S. General Accounting Office estimates that there are between 130,000 and 425,000 sites (U.S. General Accounting Office, 1987). The shortfall between the number of known locations and actual sites is extremely troublesome to those who desire an efficient means to document the presence or absence of relict hazardous materials.

Historical hazards are accumulations of hazardous materials that were left derelict prior to the formation of federal and state policies that deal with such technological hazards. Most regulatory agencies rely on hazardous-material handlers to report their activity, but this has created inventories that reflect only recent accumulations. In 1984 only 9 percent of the sites on the National Priorities List reflected activity that predated 1940 (USEPA, 1984). In addition to the many defunct businesses that never reported, most regulatory agencies only have records that date from 1976 when Congress passed the Resource Conservation and Recovery Act (RCRA). Not only are government records generally deficient in terms of identifying historical hazardous material-handling industries, but they are even less helpful in documenting specific waste management practices. Consequently, the "credibility gap," particularly in terms of historical hazards, remains.

Historical hazards are becoming ever more important, particularly as an undesirable component of real estate transactions. The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, 1980) applies strict liability and joint and several liability to owners of contaminated property, regardless of their role in causing the situation. The fact that the liability is retroactive has spurred ever-increasing concern. In New Jersey, the state legislature passed the Environmental Cleanup Responsibility Act in 1983. Its intent was to develop a mechanism to force the clean up of contaminated land and thereby protect uninformed buyers (Hughey and McMahon, 1985). The system is closely regulated by the state which has to approve of clean ups. This has caused interruptions in real estate dealings, which in turn has drawn criticism from the business community. Nevertheless, it serves the function of removing hazards and eliminating the need to re-compile previously assembled site information. In this respect, the cumulative record will have long-term benefits.

In 1986 Congress passed the Superfund Amendments and Reauthorization Act (SARA) which included provisions for property buyers to avoid liability. A buyer can argue that he/she took "all appropriate inquiry" prior to accepting the land and is therefore not culpable for clean up costs. This is commonly known as a "due diligence" defense. Building on this line of action, some states have sought means to formalize procedures for property buyers to develop legal protection (see Chapter

3). Most legislated measures require sellers to produce documentation that the land is free of contamination. This generally consists of a two-phase investigation: a records search, and if necessary, environmental testing. A critical component of the first phase of research is a site history. Site histories present information about industrial activity, practices that involved the handling of hazardous materials, and property ownership. These site-specific historical geographies are key ingredients in establishing that hazardous materials accumulated prior to the time the most recent buyer entered the scene.

The Illinois General Assembly passed the Responsible Property Transfer Act (IRPTA) in 1988 and added amendments in 1989 (PA 86-679), and for all practical purposes it became effective in 1990. Initially, some perceived it as Illinois' entry in the due diligence legislative movement (Farer, 1989), although the legislature clearly stated in the Illinois Superfund law (PA 85-1400) that the IRPTA disclosure document would not serve as a due diligence document. This report will explore the significance of historical hazards as they relate to the IRPTA and due diligence site assessments.

1.2 Illinois' Property Transfer Legislation

Illinois' Responsible Property Transfer Act (IRPTA) represents a compromise. The Illinois Chamber, one of the early sponsors, presented a case to the legislature that a New Jersey-type law requiring state approval prior to property transfer would interfere with real estate transactions and also drive industry away from Illinois (Illinois Environmental Regulatory Group, 1988). They lobbied for a bill that would, through a disclosure document filed with the state and the county recorder, inform purchasers of potential environmental liabilities. Other organizations and state agencies sought a more comprehensive process that would have mandated thorough site investigations, and for a bill that would have covered a broader range of property transactions. The legislature ultimately passed a bill that required two categories of transfers to be affected. Only parties with underground storage tanks that were used some time after 1974 and those handling hazardous materials and thereby reporting to the Illinois Environmental Protection Agency (IEPA) under the Community Right-to-Know had to file (Olian, 1989). In effect, the bill only calls for information from active operations, thereby ignoring defunct businesses. This allows owners of former industrial sites to transfer property without submitting disclosure documents. Further under-reporting will occur among underground storage tank owners. Many have not reported their tanks to the State Fire Marshal, and consequently, they are unaware they should report under the IRPTA. There is confusion about who should report under the Right-to-Know legislation, and some businesses are submitting unnecessary forms. While this may offset under-reporting somewhat, it will not add vital information about relict industry. Although the disclosure document is not intended to serve as a due diligence defense, the stated purpose of the IRPTA was to "ensure that parties involved in certain real estate transactions are made aware of the existing environmental liabilities associated with ownership of such properties, as well as the past use and environmental stautus of such properties" (PA 85-1228). From the perspective of a historical researcher, the disclosure document does very little to make new owners aware of past use and environmental status.

IRPTA proponents sought to establish a disclosure procedure and thereby deter more onerous measures that might interfere with real estate dealings. Nevertheless, the financial community demands site assessments that call for more detailed information about past land uses. As a consequence, the IRPTA has created the need for two separate filings -- one a report to the lending institution and a second to the IEPA (and the county). If the information required by the lending community and the disclosure documents were the same, property sellers could avoid redundant effort.

In reference to historical land uses, the disclosure documents will provide little useful information for identifying unknown hazardous material sites. Not only does it ignore all but extant businesses, that have already reported the presence of on-site hazards, but the disclosure document requests information on activity that occurred primarily during the most recent ownership. The seller is asked to provide information regarding activity under prior ownership "if the transferor has knowledge," but this wording does not impel active research into past activity that others may be aware of. Furthermore, many of the responses required by the seller call for information about post-1970 permits and interaction with regulatory agencies. This assumes there was no hazardous material-related activity prior to the formation of national and state environmental regulatory agencies in 1970.

Environmental consultants and lawyers frequently advise their clients to seek much more thorough documentation about past activity on property they wish to buy (Goss, 1989; Payne, 1989). However, some businesspeople misunderstand the IRPTA procedure as a due diligence defense.

1.3 Property Transfer and Site Histories

Since the passage of CERCLA there has been a growing interest in historical hazardous material sites. The Superfund legislation went beyond the "cradle to the grave" tracking system of the Resource Conservation and Recovery Act (RCRA) and called for the development of an inventory of hazardous waste sites, both <u>past</u> and <u>present</u>, that pose an imminent health hazard. Although the legislation carried no means for systematic identification of older sites, many states have attempted to develop computerized data bases that list recent and historical sites. The state of New York mandated that industries report on activities that went back as far as 1952. Their system relies on self reporting, and the initial inventory was far from complete (New York Department of Environmental Conservation, 1985). Both Washington and Illinois have developed inventories of active and inactive industries that handled hazardous materials (Washington Department of Ecology, 1987; Schock et al., 1988). The intent of these projects is to compile a listing of sites where hazardous materials have been handled over the past century. Other states have taken on systematic inventories of surface impoundments (Autin, 1980; Piskin et al., 1980) or other land disposal sites such as landfills (Mehnert and Keefer, 1988). Each provides a more complete picture of the significance of historical sites and also points out the inadequacies of our national inventories.

Lending institutions and those buying and selling real estate have also become keenly aware in the past decade of historical hazards. Examples abound of naive buyers taking title to property requiring a multimillion dollar clean up or of banks foreclosing on land that suddenly becomes a tremendous liability. Most lending institutions now mandate site assessments prior to granting loans for certain types of property. They seek to minimize their risks by having the borrower secure documentation that the site is free of contamination (Leighton-Smith, 1987; Feldman, 1985; Shumate, 1987). In fact, it is the lending institutions that are driving the expanding practice of site assessment work which results from the interpretation of CERCLA and SARA.

Realtors and real estate developers are also gaining familiarity with the liabilities imposed by CERCLA, particularly in large cities with an industrial past. In states like Illinois where there is a rapid transition of former industrial property to other uses (Winder, 1986), this is particularly pertinent. Buyers assume the principal risk, but realtors or intermediaries can take on partial responsibility even if they manage the site temporarily (Waldstein, 1988; Glass, 1987; Italiano, 1987).

Environmental consultants, law firms, and professional organizations are assembling standard procedures for conducting site assessments (Connolly et al., 1989; Federal National Mortgage Association, 1988; Moskowitz, 1989; Goss, 1989; ASFE/AEFPG, 1989; Berger and Castoria, 1988). Most call for a title search to identify potential hazardous material-handling businesses, a review of permits with regulatory agencies, and a general site history. If the records search indicates that hazardous materials were handled on site or on adjacent property, the consultant will conduct various environmental tests to identify the specific site and contaminant. All too often, the procedures emphasize either establishing the chain of title or expensive environmental testing. What is lacking in most is a thorough examination of historical activity and past land uses. Ownership is a poor indicator of past activity, and without accurate information about the location of former industrial processes and waste management practices, environmental testing can be a hit-or-miss proposition. No single phase of the site assessment is expected to satisfy the "all appropriate inquiry" standard, but each should be carried out with equal thoroughness.

Observers of the current site assessment practices have criticized the role of inappropriately trained investigators. Mauch (1989) argues that there are no adequate guidelines for developing an innocent landowner defense and that individuals preparing site assessments are inappropriately trained. This is particularly applicable to site histories. Although engineers and environmental scientists are highly trained in their own specialties, when venturing into archives and historical records they are often inefficient and uncritical. Consequently, even if they follow standard procedures, they may not assemble an adequate site history and can become diverted from doing the work they are trained to do. Public historians currently are discussing a formal procedure for site history work which will complement standards prepared for the engineering and environmental science components of site assessment. Obviously greater interdisciplinary cooperation is necessary along with a recognition of the skills necessary to conduct the historical component of site investigations.

There are examples of methods used to document thoroughly past hazardous material-related activity. White (1984) offered one of the first methodologies. It focused on historical sources and attempted to identify sites unknown to regulatory agencies rather than cross-checking their recent files (see also Stirling, 1990). In addition there is a sizable literature on historical investigations of industrialized regions (Colten, 1985; Colten and Breen, 1986; Colten and Samsel, 1988) and historical analysis of waste management practices over the past century (Tarr, 1985a, 1985b, 1984; Melosi, 1981).

Historical sources, when properly used, can add to our knowledge of the number of sites where hazardous materials were handled in the past and also improve our understanding of specific activities associated with parcels of real estate. By preparing adequate site assessments, replication of effort and uncertainty about relict hazards will be reduced significantly.

1.4 Developing Guidelines and Methods

This report has a narrow scope and will focus on the historical component of property transfer site investigations. We do not recommend that those involved in property transfers rely on documentary evidence exclusively. We do, however, encourage those producing and consuming site assessments to examine the historical record with greater care and to expect more than a cursory review of government agency files. This material, when used in conjunction with information supplied from environmental tests, can produce a more complete picture of past hazardous material-related activity than called for by the IRPTA. Thorough site assessments should be the product of skilled, interdisciplinary research teams, with each specialist carrying out work in his/her area of training and expertise.

The underlying purpose of this investigation is to report on the existing standards for site history preparation and to recommend improvements. Toward this end, we found it necessary to review the rather extensive literature on site assessment work, to interview practitioners, and to contrast their advice with the existing Illinois legislation. Given the wide disparity between evolving site assessment procedures and the IRPTA disclosure document, we seek to offer an argument for greater compatibility between the two types of reports.

This report will be divided into several sections. The first will examine historical waste generation and disposal practices as a guide for site assessment preparers unfamiliar with industrial technology of the past. The following section will review site history practices reported on in the published literature and offer the results of our interviews. It will also list methods and sources that can yield detailed portraits of past hazardous material-related activity. A subsequent section will offer a recommended procedure for efficient use of historical sources. The final chapter will offer recommendations for improving historical reporting in site assessment work and possible adjustments in the IRPTA. Appendices contain samples of the questionnaires, a thorough guide to historical source material, and an extensive bibliography.

CHAPTER 2. HAZARDOUS MATERIAL GENERATION AND DISPOSAL PRACTICES

During the past 100 years there have been numerous sources of hazardous materials such as the iron and steel trade, metal plating, oil refining, and chemical manufacture (Coates et al., 1982). Disposal and treatment of unwanted byproducts were often haphazard undertakings until very recently. Manufacturers have been free to discard solid and liquid wastes as they choose, and waste disposal firms have generally followed the guiding principal "out of sight, out of mind" (Melosi, 1981; Tarr, 1984). This has resulted in situations where hazardous materials have accumulated in the vicinity of industries that worked with these materials; and as land uses in older industrial districts begin to change, these relict deposits are rediscovered (Colten, 1990a). Furthermore, rural dumping of hazardous materials has created numerous incidents of ground-water contamination (Burmaster, 1984; Herndon, 1983).

This section will review the changing industrial technology in Illinois to provide a temporal framework for others investigating historical hazards. It is important to understand that currently active industries and businesses are not the only sources of hazardous materials and they operate in a regulatory environment that provides much more complete documentation of hazardous material-related activities. Those manufacturers that closed prior to 1970 are the ones most likely to have escaped the inventories and therefore most likely to pose a problem in the transfer of real estate. For that reason, this report will emphasize industries that operated before 1970. The emphasis that site assessments place on past land uses demands that those involved in this activity should have adequate knowledge of industrial technology of the past 100 years and historical waste management capabilities. While this review is only cursory, it will serve as a guide to the extensive contemporary literature dealing with these topics.

2.1 Major Industries

During the early years of this century iron and steel manufacturing was probably the largest generator, and it has remained a significant contributor of hazardous materials. Ore consumption in southeast Chicago more than tripled between 1890 and 1910, reflecting its emergence as one of the leading steel-producing regions in the country (Colten, 1986; Warren, 1973). In addition, Joliet and the East St. Louis metropolitan area also built up substantial iron and steel complexes in the first decades of this century. With steel production, and associated coke manufacture, sizable quantities of hazardous materials accumulated in these manufacturing districts.

Prior to 1915, most coke produced for firing ores was made in beehive ovens, and there was no attempt to recover byproducts. In the process of quenching the coke, workers poured water on the product and inadvertently created a wastewater that contained tars, phenols, cyanide, and napthaline (Coates et al., 1982:5-39). In addition, coke production left sizable quantities of coal tars, light oils, and ammonium sulfate.

Gradually during the early twentieth century and increasingly after 1910, there was a shift from the beehive oven to the byproduct coke oven. These ovens enabled producers not only to utilize the coke, but also to recover the tars, oils, organic chemicals, ammonia, and sulphur. Development of the domestic industrial chemical industry created markets for organic chemicals in the production of munitions and medicines. Tar found application in roofing and siding materials, and sulphur supplied an essential ingredient in the production of sulphuric acid -- a widely used industrial acid. There were liquid waste streams associated with the making of coke, and disposal was rudimentary. Common practices included dumping the phenols, cyanide, and napthaline into convenient water courses, using the waste liquor as a quenching liquid, or simply pouring it on the ground at the site (Fig. 2.1; Coates et al., 1982: 5-40--41). Although there was a large demand for many of the byproducts, especially during World War I, consumption of benzene and phenols fell dramatically after 1919. Coke works continued to operate, but what had been economically valuable products became wastes during the 1920s and found their way into the nearest land or water sinks. In 1925 coke producers dumped approximately 26 million tons of still wastes into the nation's waterways (Leitch, 1925). On-site disposal also remained an inevitable practice. The release of phenols and other coke wastes remained a serious water quality issue through the 1960s.

In the actual production of iron and steel there are many other sources of hazardous materials. Slag is the principal waste from blast furnaces. The chemical composition of the slag is partly dependent upon the ore used, but hazardous materials can be found in some slags. Heavy metals and cyanides are not uncommon. Furthermore, pouring of acids from the metal processing stages on the slags was a common practice and can alter the chemical balance of the adjacent soils. Other byproducts of processing steel are oils, lead, and cyanides. These wastes are generally associated with the processes used after 1900 (Hodge, 1939; Coates et al., 1982).

Another serious problem that concerned steel makers throughout most of this century was the large volumes of acid used in the pickling process. Before the late 1930s, there was virtually no treatment of these wastes. Municipalities shunned the waste liquor because it corroded the plumbing of their treatment facilities. Steel mills generated about 500 million gallons of this liquid annually. By the late 1930s there was growing opposition to the use of rivers and streams for disposal of pickle liquor (National Resources Committee, 1939).

Disposal took the least costly form in most cases. Steel manufacturers in the Lake Calumet area of south Chicago dumped most of their liquid wastes into the Calumet River through the 1950s and provided little if any treatment. Sediments settled on the river bed and caused problems with navigation. Periodically, the Corps of Engineers and their contractors dredged the waterway and used the dredge spoil to fill huge areas of wetlands or simply transferred the spoil to Lake Michigan (Colten, 1985). Similar practices transformed wetlands in Madison and St. Clair counties as well (Colten and Samsel, 1988). In addition, lagoons and land dumping of liquid wastes were commonly used during most of the first half of this century.

1910s and 1920s

Coke	Tars recovered and sold. Limited recovery and sale of benzene and toluene, most discharged to waterways. Methods to recover ammonium chloride developed in 1920s. Settling ponds develop calcium carbonate and calcium sulfate sludges. Phenol removal attempted, but limited success. Also, some on-site treatment such as skimmers, settling basins, and filters.
Metals Manufacturing and Processing	Slags used to reclaim land on site; acids and oils released untreated into waterways.
Oil Refining	Limited recovery of sulphuric acid (used in manufacturing elastic), although land burial of acid sludges common. Oily wastes and other byproducts discharged directly to water bodies or land.
Chemical Manufacture	Discharge of liquids to water sinks, land dumping of solids. Also, evaporation, neutralization, and adsorption.
Metal Plating	Acids and toxics directly to water sinks or via city sewers for dilution.
General Urban Wastes	Activated sludge treatment available for sewage; dumps at urban fringe for solids.

(continued)

1930s

Coke	Ammonia recovered; tars used in road and roof construction; and limited phenol recovery and recirculation.
Metal Manufacturing and Processing	Land dumping of slags, although increasing recovery of this byproduct. Pickle liquors diluted or chemically treated to recover copperas, sulphuric acid, or siderotilate. Use of municipal sewers and treatment facilities. Increasing use of on-site treatment.
Oil Refining	A.P.I. recommends separators and lagoons for handling oily wastes. Acid sludges buried, burned, or recovered. Increasing recovery of byproducts.
Chemical Manufacture	Limited use of holding tanks and impoundments to control timing of releases; neutralization, evaporation, and primary treatment of liquid wastes; limited use of municipal treatment facilities; neutralization with other wastes.
Metal Plating	Controlled releases of cyanides and acids to permit dilution by receiving streams, or dilution with other urban wastes in municipal sewers. Some use of lagoons.
General Urban Wastes	Increases in number of treatment facilities; activated sludge; little technological advancement. Garbage dumps at urban fringe.

(continued)

1940s

Coke	Ammonia wastes used in quenching coke; evaporation and burning of phenolic liquors. Phenols treated by activated sludge, trickling filter, and recovery.
Metal Manufacturing and Processing	Pickle liquors processed to recover ferrous sulphate or neutralized with lime and iron oxides settled out. Sludge pumped to lagoons and later used as fill.
Oil Refining	Improved separators for oil wastes; oil sludges incinerated or flushed to sewers; acids removed from acid sludges; oil residual burned from clay filters; and settling lagoons. Neutralization of acids; spent "doctor sludge" (high lead content) treated to recover sodium plumbite; phenols treated with biological filter. Lagoons used for settling and evaporation.
Chemical Manufacture	Solids and liquids interred in pits; recovery of byproducts; neutralization of acids; oxidation; and lagoons.
Metal Plating	Chemical precipitation of cyanide wastes to remove toxic constituents; reduction of chromium wastes; and lime as neutralization agent. Dilution and lagoons.
General Urban Waste	Introduction of sanitary landfill; sewage treatment facilities handled limited quantities of industrial wastes; increasing number of municipalities with primary treatment facilities by end of decade.

(continued)

1950s

Coke	Phenol recovery via solvent extraction process or steaming out. Ammonia recovery by bubbling a gas through dilute sulfuric acid. Acid sludge disposal: dumping or heaped on hot slag, incineration, or recovery of light oils and sulfuric acid by washing. Oily wastes: separators, skimmers, and filters. Napthalene and anthracene recovery in cooling process.
Metal Manufacturing and Processing	Neutralization (with lime) of pickle liquors; lime slurry stored in lagoons. Byproduct recovery: copperas recovery by evaporation or refrigeration; free acid concentrated in vacuum evaporator and recovered when copperas crystallized; ferron produced from sludges. Slags used as fill, in portland cement, and railroad ballast.
Oil Refining	A.P.I recommended ponding, dilution, deep well injection, or sale of caustics. Also they suggested neutralization, a combination of oxidation and chemical separation or stabalization via biological oxidation for caustics. For hydrogen sulfide, the A.P.I discussed stripping with steam or gas, oxidation with heat and air, or treatment with sulfur dioxide. Phenols: neutralization, solvent extraction, biological oxidation, cyclic absorption, and evaporation. Acid sludges: dumping or burial in specially constructed pits if care is taken to prevent leaching, neutralization and dilution where small quantities produced, or incineration. Also recovery recommended. Separators to remove oils. Sludges from separators: lagooning, settling, filtration, incineration, de-oiling by aeration.

(continued)

Chemical Manufacture	Neutralization for simple waste streams. Phenolic wastes: multi-stage treatment including sedimentation, trickling filters, aeration, sedimentation, and settling ponds. Sludges to drying beds. Acid wastes: neutralization by passing through lime beds or equilization in lagoons or tanks.
Metal Plating	Waste reduction by minimizing drag-out. Non-cyanide wastes: neutralization and removal of metallic ions (adjusting pH to 8 or adding aluminum or ferric sulfate). Chromate reduction: addition of ferrous sulfate. Cyanide: ponding and natural aeration (insist that precautions be taken to prevent seepage), acidification and enforced aeration, then neutralization before release to sewage. Also, alkaline chlorination most successful treatment of cyanide wastes.
General Urban Wastes	Sanitary landfills advocated for solid wastes and federal support to install primary treatment facilities for municipal sewage. Considerable quantities of industrial wastes handled by municipal facilities.

Compiled by authors.

Figure 2.1. Industrial Waste Treatment, 1910-1960.

During and after the 1940s there were increasing efforts to find uses for slags and pickle liquors. Steel mills sold the slag for use in road building, as railroad ballast, in concrete production, and for filters in sewage treatment works (Hodge, 1939). The steel industry also sponsored numerous investigations to discover processes to recover byproducts from the pickle liquor. Recovery efforts focused on reclaiming the acid itself and metals such as copper (Hodge, 1939). Effective and widespread acceptance of these techniques had not occurred by the 1950s, and disposal remained the principal concern. Land disposal had largely replaced dilution in waterways. Steel makers used sumps, lagoons, abandoned mines, exhausted oil and gas sands, and cavernous limestone (Rudolfs, 1953). Neutralization was perhaps the most widely used treatment, but even this process produced a sizable quantity of sludge that required land disposal (Fig. 2.1).

Oil production was another major source of pre-1960 hazardous materials. Production of refined oil nearly tripled between 1919 and 1929, reflecting the tremendous growth of the automobile industry and the rising demand for gasoline. To meet the increased demand for various products, oil refiners turned to more efficient techniques and increased the capacity of their operations (Williamson et al., 1963). The opening of refineries in the Wood River area of Illinois, near Joliet, and in neighboring Whiting, Indiana, all date from this early twentieth-century expansion of the oil industry.

The earliest debate over refinery wastes focused on the use of waterways as sinks. In 1924 the U.S. Congress passed the Oil Pollution Act. It was an attempt to deter widespread contamination of rivers and seashores, but it applied only to coastal waters where ocean-going ships dumped oily ballast into harbors. Consequently, the use of rivers as waste receptacles continued (Pratt, 1980). In Illinois, the Sanitary Water Board sought to halt the dumping of oil waste into streams and they were able to convince most of the Wood River refineries to remove oil from their effluent before releasing it into the Mississippi River (Colten and Samsel, 1988). Working within the framework for proper waste management recommended by their trade organization and the state health department, the Madison County refineries constructed lagoons which held the waste liquor temporarily, allowing evaporation and sedimentation. They also installed separators to skim oily wastes before the effluent entered the Mississippi River (Abatement, 1936). This allowed for significant accumulations of sediments and sludges which contain hazardous materials. Other sludges contained lead and acids (Hill, 1939).

During the 1940s and 1950s, more sophisticated waste removal and treatment equipment became available, but lagoons and separators remained the most common facilities at refineries (Fig. 2.1). Problems with extraction of oil emlusions and also with the application of common treatment technologies to oil refinery wastes presented the chief obstacles to more effective management of these wastes (Rudolfs, 1953). The American Petroleum Institute (API), which issued waste treatment guidelines to its members, recommended a variety of procedures including ponding liquid wastes, burial of sludges, filtration, neutralization of acidic wastes, solvent extraction, and recovery of useful byproducts (API, 1953; API 1951). Their guidelines reflect industry leaders' wishes to deflect more stringent state and federal regulations (Pratt, 1980). There was, however, a tremendous range of acceptance

within the industry. In spite of a sound understanding of the potential for ground-water contamination, unlined land disposal sites commonly served as the principal means of waste management.

In conjunction with the growth of oil refining, the petro-chemical industry rose in importance. During the 1920s, many coal-based chemical concerns adopted petroleum as their basic raw material, although the coke byproduct industry remained vital. Organic solvents were a principal product of both industries. Acids were another product widely produced in Illinois and consumed by the iron and steel industry. The chemicals were used in the manufacture of medicines, munitions, and other assorted products. Increasingly complex chemical combinations became viable during the 1930s, and PCB's (polychlorinated biphenyls) emerged as another Illinois product. Fertilizers and pesticides (containing arsenic through the 1930s and complex hydrocarbons after 1940) were other important products of the state (Spitz, 1988; Coates et al., 1982; Goldman, 1984). Thus, prior to the outbreak of World War II, many durable hazardous materials were commonly handled in industrialized sections of the state.

Chemical manufacturers, like steel mills and refineries, had to provide their own treatment because their wastes, in large quantities, would disrupt the operation of municipal treatment works (Besselievre, 1931; Eldridge, 1942). They generally sought chemical solutions to waste disposal problems (Fig. 2.1). Chief among the practices advocated by these firms was neutralization of acidic wastes with alkaline wastes. Dilution was another option and this involved gradual releases so that river systems could adequately dilute toxic effluent. Another practice that was not discussed in the published literature was dumping wastes in pits or holes on company property. There have been documented instances of this occurring in Illinois (Colten and Breen, 1986; Colten and Samsel, 1988). This inexpensive method of waste disposal kept hazardous materials from entering surface water supplies and also protected municipal sewage treatment works. However, impacts on ground-water supplies have occurred, and these dumps have created problems for subsequent redevelopment projects. Incineration offered another means of inexpensive waste disposal.

Sanitary engineers recommended a variety of treatments to chemical producers in the 1950s. For phenolic wastes, they advised the use of sedimentation, trickling filters, aeration, and settling ponds (Besselievre, 1952). Neutralization remained the most widely advocated procedure for acid wastes (Rudolfs, 1953). Most of these processes were non-destructive to toxic elements and permitted continuing releases of hazardous materials to waterways and to land disposal sites (Miller and Burch, 1981). For solid wastes, specialists increasingly urged the adoption of recovery and incineration rather than the use of landfills (Ross, 1968).

Like the oil industry, trade organizations offered guidance to member companies (Fig. 2.1). The Manufacturing Chemists' Association (MCA) issued manuals on pollution abatement. One of its earlier publications stated:

> A progressive company which is law-abiding and jealous of its good name would certainly want to abate all pollution which causes nuisance, or which results in conditions contrary to legally established standards (MCA, 1948:4).

Yet, it conceded that "many plants have been put into operation without adequate consideration of wastes handling" (MCA, 1948:5). Its 1949 manual on waste treatment methods was somewhat vague and suggested rather rudimentary techniques for removing solids by ponding, filtration, or flotation (MCA, 1949). A subsequent revision of the manual on oils and tars offered more detailed recommendations, but still advocated burial and ponding of wastes. It did, nevertheless, warn against subsurface contamination by leachate from waste disposal ponds (MCA, 1955:8).

Metal plating has been another major source of hazardous materials and also has presented environmental engineers with serious treatment challenges. Electroplating; or the application of specific finishes by an electro-chemical process to metal products exposed to excessive wear, temperature extremes, or environmental conditions; emerged in Europe in the 1850s, found widespread application in the United States before 1900 (Trescott, 1981), and was common in Illinois before 1920. Wastes common to plating industries included a variety of toxic metals such as nickel, chromium, cadmium, zinc, and lead along with cyanide and acids.

From the early stages of electroplating there has been concern with recovery of metals, particularly gold and silver. Wahl (1883) prescribed steps to recover precious metals and more common metals such as nickel, platinum, and copper. He advocated that "nothing whatever should be allowed to go to waste in well-conducted works" (p. 416). Nevertheless, by the 1940s metal plating operations were well known as sources of troublesome wastes, to say nothing of concern with the waste of critical resources such as chromium. Experiments with chemical treatment of the toxic hexavalent chromium wastes found ways to reduce it to a non-toxic trivalent form in the early 1940s (Hoover and Masselli, 1941). Land disposal and lagoons were generally favored for the management of liquors containing toxic metals owing to the expense of treatment. Plating operations generally treated cyanide wastes by dilution in waterways (Fig. 2.1).

Increasing production of electroplated products increased concentrations of toxic wastes in waterways and forced greater attention to the problem during the 1950s. In Illinois, the Sanitary Water Board conducted a series of demonstrations for plating companies to illustrate the impact of unregulated release of toxic compounds to streams. They encouraged platers to send their wastes to municipal treatment plants in regulated, not batch, flows. As long as the plating liquor was diluted by the municipal sewage, it could pass through the treatment works. Nevertheless, toxic materials continued to accumulate in sludges of the treatment works. Some manufacturers installed treatment facilities and buried sludges on their own property. Others collected their wastes and shipped them out of state for recovery (Colten and Breen, 1986).

The ion exchange treatment method for chromic wastes made its appearance in the mid-1950s and offered an economical method to purify and recover chromium (Corcoran, 1955). This process, however, did not produce a waste suitable for direct discharge to waterways and further treatment was required (Ross, 1968). It is uncertain how commonly Illinois industry adopted the ion exchange treatment method.

Recovery of cyanides was not a common practice in the early 1950s. Controlled releases and dilution in streams were the methods used by most platers (Graham, 1955) and such practices contributed to fish kills.

2.2 Smaller Scale Hazardous Material-Handling Businesses

In addition to the many large industries commonly associated with hazardous materials, there were numerous smaller operations that handled a variety of toxic, corrosive, explosive, or even radioactive materials. Some used the hazardous substance as a minor part of a larger operation or remained a small plant. Some conducted business in the center of the city and relied on municipal sewage removal services to handle their wastes and therefore never created significant accumulations. Others operated throughout urban areas and may have been displaced in the last few decades, leaving little trace of their former presence. This section will provide an overview of these types of manufacturing and service industries that should be known to parties engaged in present-day real estate transactions.

In addition to coke manufacture, there were a number of coal byproduct industries that worked with hazardous substances during the early twentieth century. Abundant supplies of coal made Illinois a natural place for this type of complex to develop. One of the earliest sources of hazardous materials deposited by coal-related businesses was the local gas works. Most towns with populations of 4,000 or more at the turn of the century had a town-gas plant. These operations produced coal gas used to illuminate street lights. The technology used in these plants came into widespread use in the 1860s. Although most plants closed by the 1920s, some Illinois operations continued producing gas until the 1940s. The gasification process produced coal tars containing benzene which plant operators typically dumped in pits on site.

The explosives industry began operating in Illinois in the late nineteenth century and manufactured dynamite for use in the coal mining industry. During the 1910s, the explosives industry began to manufacture TNT (trinitrotoluene) using the organic solvent toluene derived from byproduct coke plants. Some plants diversified into munitions and therefore worked with metals such as lead and brass prior to 1920. During World War II, the federal government opened numerous army ammunition plants across the country. Following the war, the army closed many of these plants, leaving relict factories scattered across rural America. Loading, assembling and packing explosives produced a waste water that contained various concentrations of the explosives. In the past, facilities diverted effluent to lagoons for evaporation and percolation. Ground-water contamination by TNT and RDX (cyclotrimethylenetrinitramine) has occurred at some sites (Turkeltaub and Wiehl, 1989; Kingsbury and Ray, 1986).

Creosote works also have left behind residues containing organic solvents and other hazardous materials. Plants that imbued timbers with creosote as a means of waterproofing commonly are found on the Superfund list. These plants typically constructed ponds that held wastes containing napthalene, fluorene, and pentachlorophenols (PCPs). Unlined pits have proven ineffective in holding these

organic contaminants, and migration into the ground-water system is common (Bedient et al., 1984; USEPA, 1984; Ball, 1986).

Coal mining areas also produced acid drainage, although this problem was not as pronounced in Illinois as in Appalachia (Coates et al., 1982). Hazardous material accumulations have occurred in shaft mines as the result of illegal dumping of wastes into abandoned mines.

Oil pumping was another type of extractive industry that produced hazardous substances. Across southern and central Illinois oil fields have existed from early in the twentieth century and they produced over 182 million barrels from 1907 through 1912. Crude production reached a second peak during the early 1940s when drillers pumped 100 million barrels annually for several years running (Miller, 1984). Producers commonly released unwanted brines into waterways until neighbors complained about stream contamination. To manage oily wastes, drillers either would dump it into streams or build shallow ponds and burn the accumulation at irregular intervals. Disposal became a serious problem in producing regions in the 1930s, and state and federal agencies began to investigate the situation. Their reports recommended better "housekeeping" to reduce the volume of wastes, reclaiming oils, and improved construction of brine ponds to reduce drainage (Schmidt and Wilhelm, 1938). Some producers returned brine to the ground or used it to "repressure" dry wells (Eldridge, 1942). Illinois regulations called for construction of impermeable lagoons for brine evaporation ponds and prohibited construction of such pits in permeable soils (Bell, 1957).

Some of the oil field wastes found application as road oils. Beginning in about 1908, engineers experimented with road oiling in Illinois, and by the early 1920s, it was one of the most important methods of road preservation in the state (Clemmer, 1923; Illinois Highway Commission, 1911). In 1923, highway maintenance crews applied over 40 million gallons of oil to Illinois roads and streets (Reed, 1924). Railroads also used oil to suppress dust on their roadbeds (Halbert, 1928). By the 1930s, water companies and private well owners had begun to complain about foul tasting water created by road oiling operations. Subsequent investigations found the greatest danger of excessive runoff existed when a rain storm occurred immediately after application, and researchers suggested the use of low-phenol tars to reduce undesirable tastes (Carpenter et al., 1934). The use of oils on roads continued through the 1980s, although with the extension of paved surfaces to more and more rural areas, less oil was called for. Use of contaminated oils in recent years has resulted in instances of contamination.

In addition to oils, pesticides applied along railroad right-of-ways, highways, and in agricultural areas are potential sources of property contamination. From the late nineteenth century until the mid-1900s, arsenics served as the most effective weed killer. In Illinois, use of arsenic for controlling agricultural pests found application in orchards and high-value specialty crop areas (University of Illinois, 1903). Agricultural experts did not consider it a viable means of protecting corn crops (University of Illinois, 1901). In other areas of the Midwest, farmers used arsenic pesticides to combat periodic infestations of pests such as locust and crickets. Former mixing stations or pesticide dealer sites could hold early twentieth-

century accumulations of arsenic (USEPA, 1984:244, 249; Long, 1987). Widespread application of pesticides to Illinois' major crops began after 1940.

Chlorinated organic compounds entered the agricultural market in the early 1940s. Products such as DDT led the list of durable and effective pesticides and provided many farmers with a new means of controlling pests. Organic phosphates (e.g., Parithion) joined the organic hydrocarbons as pest controls, but they were accompanied by warnings about possible health hazards to humans and livestock (Illinois Custom Spray Operators Training School, 1950). Such warnings did not deter use however. Carbamate and organophosphate insecticide use increased during the 1970s, while application of the more environmentally durable organochlorine products declined. Yet due to heavy use during the 1950s and 1960s, Illinois has some of the highest concentrations of chlorinated hydrocarbon accumulations in its soils (Illinois Custom Spray Operators Training School, 1958). There is also concern about buildup of agricultural chemicals in lake bed sediments and in aquatic life. Specifically, pesticides such as Chlordane and Dieldrin appear to persist for many years in lake environments.

Application of durable chemicals also occurred along railroad, highway, and utility right-of-ways. Arsenic-based pesticides were the most common weed killers prior to 1940; afterwhich, DDT and the other complex organic compounds replaced the inorganic arsenics (Hernandez, 1977). Multiple application along right-of-ways and runoff may have produced residuals along the areas of application or in adjacent waterbodies. Spills of solid or liquid hazardous cargo is another potential source of contamination along transportation routes.

Another form of transportation corridor that has produced contamination is the interstate pipeline. Long-distance transmission of petroleum began in Illinois when a pipeline from the Cushing oil fields in Oklahoma reached completion in 1918. Leaks in the pipeline delayed its opening and characterized the problems facing oil pipelines (Beaton, 1957). Pipelines may convey crude oil, heating oil, gasoline, or natural gas. Metal pipe placed in the soils is susceptible to corrosion which can lead to leaks. Although pipeline companies monitor their lines, substantial quantities of product can escape before detection. In 1959, the industry issued its first code for construction and maintenance of pipelines (American Society of Mechanical Engineers, 1959). Subsequent revisions called for high standards in materials and leak detection, but leaks that occurred prior to the 1970 codes could have left contaminants on right-of-ways or adjacent property. In addition to leaks of products, there are instances of PCBs accumulating at compressor sites along pipelines (U.S. Senate, 1987).

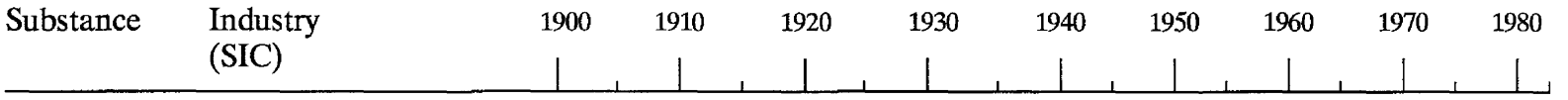
A variety of transportation service facilities present potential situations for hazardous material accumulations (see Section 2.3). Aircraft maintenance operations have used solvents such as trichlorethylene since the 1940s, and spills or inappropriate dumping have resulted in ground-water contamination at some airports. Tank cleaning operations (rail and truck) have been sources of contamination through careless dumping of residuals washed from containers. Grain elevator operators have used carbon tetrachloride to control rodents and this practice has left behind suspected contamination.

Chlorinated hydrocarbon solvents began to displace Stoddard solvent in the dry-cleaning industry in the early 1930s. The principal solvents included carbon tetrachloride, trichlorethylene, and perchlorethylene. These solvents offered benefits over the flammable Stoddard solvent and enabled dry-cleaning establishments to operate in a wider range of sites and without the restrictions imposed by fire marshals and insurance underwriters on facilities handling an extremely volatile substance (Fulton, 1951). By the 1950s, perchlorethylene was the preferred solvent, and it had largely, although not exclusively, displaced the older Stoddard solvent. Most dry-cleaners attempt to reuse their solvents and avoid problems associated with disposal. During the early twentieth century alkali washes served to clarify spent solvent. During the 1920s and into the 1950s, dry-cleaners used sulfuric acid to reclaim solvents. By the 1950s filters and distillation became the most important techniques for cleansing solvents (Martin and Fulton, 1958; Randall, 1937). Nevertheless, leaking tanks or careless dumping of waste liquors into sewers are possible sources of contamination associated with former dry-cleaning operations.

In addition to specific industrial processes on site, most careful site histories will include a review of adjacent property to identify if contaminants have been used nearby. It is possible for leachate from storage or disposal facilities to migrate through porous soils onto adjoining and even distant parcels of land. Movement of contaminants can be accelerated by relict conduits. Abandoned sewer lines, former pipelines, and even agricultural field drainage tiles can serve to transport liquid contaminants long distances if the gradient permits. Rubble and fill also permit rapid migration of liquids, and reclaimed canals, mines, or quarries may allow rapid movement of contaminants from off site.

A complete accounting of all processes is impossible, but the Figure 2.2 indicates industrial activities that handled certain hazardous substances during this century. What becomes apparent is that use of hazardous substances was not limited to manufacturing activities. Printers, for example, worked with both toxic metals and organic solvents. Industries processing agricultural products also worked with solvents (animal fats and oil producers) and metals (tanning). Use of hazardous substances was not limited to the last four decades and was widespread in terms of geographic location in urban areas and scale of industrial activity. Accumulations are possible wherever hazardous materials were used due to the absence of restrictions on proper handling during much of this century.

SELECTED HAZARDOUS SUBSTANCES IN THE WORKPLACE, 1900-1980



Substance	Industry (SIC)
Aniline	Commercial printing lithographic (2752)
Arsenic	Commercial printing lithographic (2752)
Arsenic	Malt beverages (2082)
Arsenic	Paint, varnish, lacquer enamel (2851)
Arsenic	Pressed & blown glass & glassware (3229)
Arsenic	Leather tanning & finishing (3111)
Arsenic	Lead pencils, crayons & artists materials (3952)
Arsenic	Costume jewelry, buttons miscellaneous notions (3962)
Barium	Paint, varnish, lacquer enamel (2851)
Barium Sulphate	Paint, varnish, lacquer enamel (2851)
Benzene	Pressed/blown glass & glassware, unclassified (3229)

(continued)

Substance	Industry (SIC)	1900	1910	1920	1930	1940	1950	1960	1970	1980
Benzene	Leather tanning & finishing (3111)									
Benzene	Cut stone & stone products (3285)									
Benzene	Paint, varnish, lacquer enamel (2851)									
Benzene	Commercial printing lithographic (2752)									
Benzene	Animal & Marine Fats & oils (2077)									
Benzene	Weft knit fabric mills 2257									
Benzene	Adhesives & sealants (2891)									
Carbon Tetrachloride	Adhesives & sealants (2891)									
Carbon Tetrachloride	Hats & Caps (2351)									
Carbon Tetrachloride	Paint, varnish, lacquer enamel (2851)									
Chromium	Paint, varnish, lacquer enamel (2851)									
Chromium	Lead pencils, crayons & artists materials (3952)									
Chromium	Costume jewelry, miscellaneous notions (3962)									

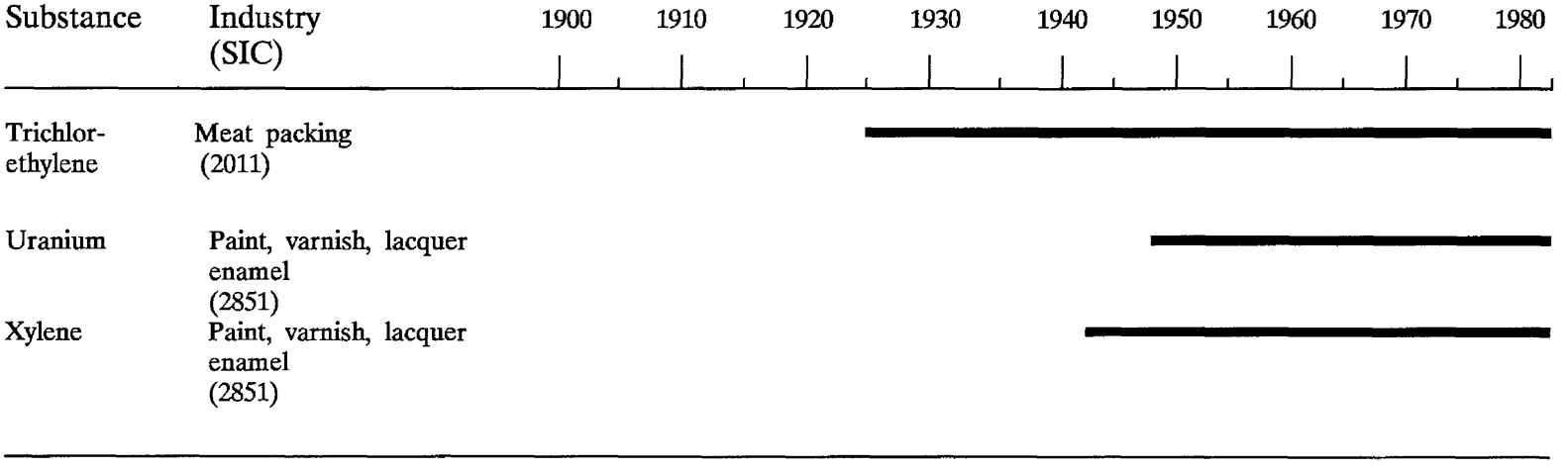
(continued)

Substance	Industry (SIC)	1900	1910	1920	1930	1940	1950	1960	1970	1980
Chromium	Glass products, made of purchased glass (3231)						▬	▬	▬	▬
Chromium	Pressed/blown glass & glassware, unclassified (3229)				▬	▬	▬	▬	▬	▬
Chromium	Leather tanning & finishing (3111)			▬	▬	▬	▬	▬	▬	▬
Chromium	Commercial printing lithographic (2752)			▬	▬	▬	▬	▬	▬	▬
Chromium	Finishers broadware fabrics synthetic & silk (2262)			▬	▬	▬	▬	▬	▬	▬
Creosols	Specialty cleaning, polishing & sanitation preparations (2842)						▬	▬	▬	▬
Formaldehyde	Specialty cleaning, polishing & sanitation preparations (2842)		▬	▬	▬	▬	▬	▬	▬	▬
Lead	Lead pencils, crayons & artists materials (3952)						▬	▬	▬	▬
Lead	Glass products, made of purchased glass (3231)					▬	▬	▬	▬	▬
Lead	Pottery products, unclassified (3269)			▬	▬	▬	▬	▬	▬	▬
Lead	Pressed/blown glass & glassware, unclassified (3229)			▬	▬	▬	▬	▬	▬	▬
Lead	Leather tanning & finishing (3111)			▬	▬	▬	▬	▬	▬	▬

(continued)

Substance	Industry (SIC)	1900	1910	1920	1930	1940	1950	1960	1970	1980
Lead	Paper mills (2621)									
Lead	Commercial printing lithographic (2752)									
Lead	Paint, varnish, lacquer enamel (2851)									
Manganese	Paint, varnish, lacquer enamel (2851)									
Mercury	Paint, varnish, lacquer enamel (2851)									
Mercury	Commercial Printing (2753)									
Mercury	Hats & Caps (2352)									
Methanol	Specialty cleaning, polishing & sanitation preparations (2842)									
Nitric Acid	Commercial printing lithographic (2752)									
Pyridine	Distilled & blended liquors (2085)									
Toluene	Paint, varnish, lacquer enamel (2851)									
Trichlor-ethylene	Specialty cleaning, polishing & sanitation preparations (2842)									

(continued)



Sources: Brandt, 1947; Collier, 1941; Hamilton, 1925; Hamilton, 1923; Kober and Hayhurst, 1924; McCord, 1931; Price, 1914; Teleky, 1948.

Figure 2.2. Selected Hazardous Substances in the Workplace, 1900-1980.

2.3 Underground Petroleum Storage Tanks

Underground storage tanks (USTs) are leaking a variety of hazardous and nonhazardous materials at thousands of sites across the country. The lingering residuals of these leaking tanks have become a major source of ground-water contamination. Any property that is or was the location of, or even adjacent to, a UST may be a high risk investment. The USEPA has estimated that there are between three and five million UST systems installed throughout the U.S. These tanks are situated on public and private land at a multitude of industrial, commercial, residential, and agricultural sites (Fig. 2.3). The overwhelming majority (95 percent) of these tanks store petroleum products, including leaded and unleaded gasoline, diesel fuel, kerosene, and waste oil (USEPA, 1988:2). An even greater, and currently unregulated, number of underground tanks are used to store heating oil; many of these have been in service for 30 to 45 years without being routinely tested or monitored for leaks (Hayman, 1989).

Petroleum products leaked from USTs have polluted more of the country's ground-water drinking supply by volume than any other class of chemical (Knox, 1988:362). A single gallon of gasoline can render 1 million gallons of water undrinkable (Matis, 1971:58). Gasoline floats on top of water and can be siphoned off using advanced remediation techniques; however, some of its toxic components -- benzene, a known animal carcinogen, and toluene and xylene, both mutagens -- are dissolved in water. These colorless, odorless toxins remain behind and may take years to remove through costly filtration techniques (Tejada, 1984:20; USEPA, 1987a:5-3).

Once petroleum USTs begin to leak, the product is absorbed into the soil and may continue to migrate into an aquifer. The rate of product movement depends on its viscosity (i.e., gasoline penetrates rapidly compared to heavy fuel oils), soil properties, and the rate and amount of product loss (API, 1980:4). As petroleum moves through the soil, some of it attenuates to individual soil particles and becomes trapped, ultimately remaining behind as "residual saturation." This condition can last for many years and present a constant source of pollution as rainwater and fluctuating water tables infiltrate contaminated soil and carry dangerous soluables into the groundwater. The longer a product remains in the ground, the more it becomes "weathered." Biodegradation, interaction with soils, and flushing with ground and rainwater reduces the toxicity of petroleum's harmful chemical constituents; however, all potential product spill and leak sites, regardless of how long ago they occurred, should be investigated (API, 1980:13; Hornshaw, 1990).

2.3.1 Factors Responsible for Current Contamination

Approximately 80 percent of tanks installed over the past two decades are made of bare steel, unprotected from external corrosion, and more than half of those in use are over 12 years old (USEPA, 1987b). Steel tanks have a higher probability of corroding and leaking after 16 years of age and many USTs are currently used beyond their recommended life while others have been abandoned, left to corrode

UNDERGROUND STORAGE TANK USERS

Airports
Auto Dealers
Auto/Truck Rental
Auto Repair Shops
Banks
Carwashes
Cemeteries
Churches
Colleges
Commercial/Industrial Office Buildings
Construction Companies
County and Local Governments
  Fire Department
  Police Department
  Prisons
  Sanitation Department
  Public Bus System
  Water Treatment Plant
  Municipal Building
  Highway Department
Convenience Store
Delivery Services (UPS,
  Department Stores, Emery, Etc.)
Distribution Companies
Elementary and High Schools
Farms
Federal Government
  Dams
  Federal Highway Department
  Military Bases
  Office Buildings
  Post Office Department
  Prisons
Home Owners
Hospitals
Hotels
Independently Owned Service Stations
Grocery Stores
Jobber Bulk Terminal
Major Oil Bulk Terminal
Major Oil Service Stations
Manufacturing Plants
Marinas
Mining Companies
Motels
Nursing Homes
Recreational Facilities
Residential Apartment Buildings
Restaurants
State Governments
  Prisons
  Highway Department
  State Office Buildings
School Bus Garages
Shopping Centers
Tire Stores
Transportation Services (Taxi,
  Limousine, Bus Lines)
Truck Stops
Trucking Firms
Utility Companies

Source: Italiano (1987).

Figure 2.3. Underground Storage Tank Users.

slowly and release any residual products that remain. Spills and overfills are the most frequent kinds of releases; however, leaks from piping connected to tanks and the corrosion of bare steel tanks present the most serious problems because large volumes of product may be lost before a leak is detected (USEPA, 1987b). Any parcel that has had a tank located on it represents a potential environmental hazard and real estate liability, regardless of whether the tank was abandoned in place, closed properly, or removed.

"Closed properly" has been an evolving standard during the 80 year history of underground storage of flammable liquids. Historical tank abandonment procedures failed to specify the need to inspect for leakage and only called for removing combustible liquids from the tank before filling it with sand and abandoning in place. Non-liquid residual sediments, tank scaling, or sludge accumulations were not routinely removed before tank abandonment. Bottom sludge in tanks used to store leaded gasoline may have an organic lead concentration high enough to qualify as a hazardous waste (Robinson et al., 1988:7). The amount accumulated in a tank bottom varies depending on the age, size, condition, and product stored in the tank. A 5,000-gallon gasoline tank with product removed to its lowest drain-off point could contain approximately 30 pounds of sludge (Johnston and Jardine, 1989:29). Abandoned tanks that still contain residues pose serious threats especially if they remain partially submerged in the water table. The most common fillers used for tank abandonment (e.g., sand and slurry) do not absorb petroleum derivatives, and consequently, once a steel tank corrodes, it can release material directly into the groundwater with a resulting threat to nearby wells (Robinson et al., 1988:27). Many current problems associated with underground tank sites can be traced to regulations and industry guidelines of the last 80 years which have allowed the environmental consequences of failed tanks to be ignored.

2.3.2 Petroleum Marketing Dynamics and Regulatory Response

In the early 1900s, the petroleum industry depended upon hundreds of hardware and grocery stores, garages, and blacksmiths to store and distribute gasoline to the growing ranks of motorists. These early facilities, located in and around central business districts (CBD) of communities, used aboveground storage tanks and curb side pumps (Vieyra, 1979). After numerous fires and explosions, the National Fire Protection Association (NFPA) drafted guidelines for handling flammable liquid materials, and underground tanks emerged as the principle means of storage (NFPA, 1913). The pioneer guidelines instituted correct installation procedures for underground tanks to "safeguard life and property against loss by fire" (Fig. 2.4). Several states adopted NFPA guidelines as "appropriate technology" for managing and reducing the risk of flammable materials.

A burgeoning automotive industry created the need for more specialized gasoline outlets, and drive-in filling stations began to appear on the landscape (American Society of Planning Officials, 1973:4). In contrast to curbside pumps, filling stations heralded a marked change in land use; the former required neither the demolition of existing buildings nor breaks in the curb line, while the latter required a large lot for a building, pumps, and underground tanks; in densely built-

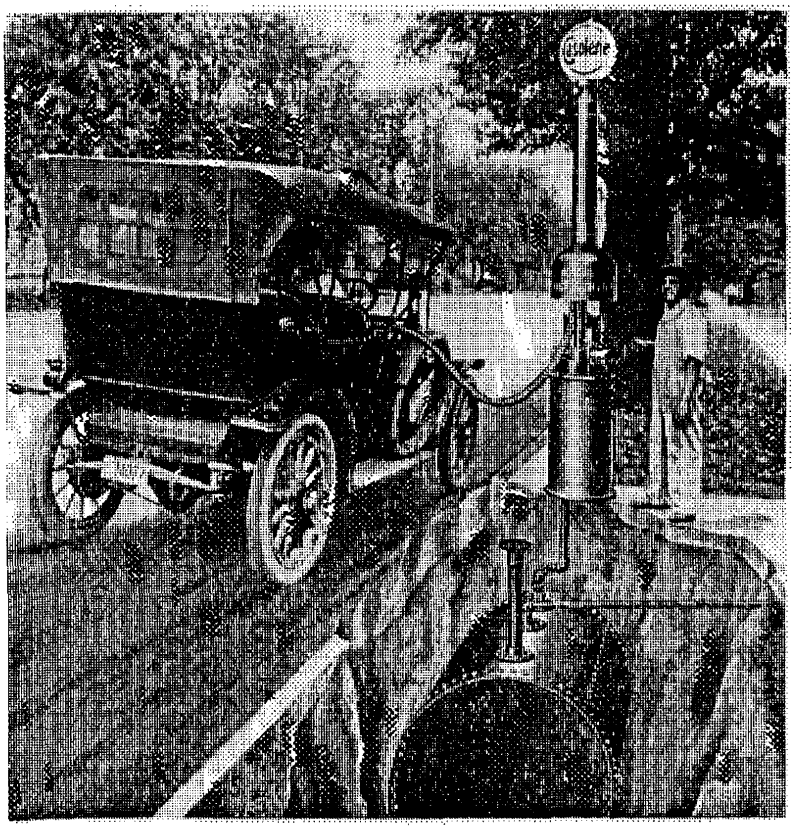


Figure 2.4. Proper Underground Storage Tank Installation, ca. 1913. Source: Illinois State Fire Marshal (1916).

up areas, gasoline marketers leveled buildings to make room for new filling stations (Lieb, 1985:97). Many of these early stations had at least two underground tanks even though they offered only one grade of gasoline (Bean, 1920).

A number of states and localities began to adopt regulations applicable to the underground storage of petroleum products; however, these early laws and standards did not consider the environmental consequences of tank failure or abandonment. In 1919, the Illinois General Assembly passed an act to eliminate the dangers of storing, transporting, selling, and using gasoline and volatile oils (Illinois Department of Trade and Commerce, 1919). For the first time in Illinois, the state required that flammable liquids be stored in underground tanks. The Illinois act specified tank capacity, location, construction material, and protection against corrosion, but did not outline any procedures in the event of leaks.

From 1920 to 1940, gasoline glutted the market and the petroleum industry realized they needed a new marketing strategy. Competition for retail outlets became so keen that, in many cases, petroleum companies ignored wholesale and retail earnings. Refiners and independent oil companies attempted to secure existing retail outlets by means of subsidies. Wholesalers' offered pumps, tanks, and equipment to retailers as inducements to market their products. High unemployment rates during the Great Depression and the oil companies' "free" equipment installation policy accounted for a huge increase in the number of service stations (National Petroleum News, 1928). This new group of gasoline outlets occupied sites along major transportation approaches just outside of the CBD.

After 1940, the number of outlets selling gasoline, both service station and secondary outlets, began to decline for nearly a decade. With wartime gasoline rationing, between 1942 and 1945, service station construction came to a virtual standstill and many gasoline outlets closed (Hogarty, 1981:24). Reflecting the age of the gasoline marketing industry, some of the earliest tanks installed began to corrode and leak while many others were abandoned. In response to a "considerable increase in the number of reports of leakage from underground gasoline tanks and piping" the NFPA amended their guidelines in 1941 to include methods for locating problem underground storage tanks. Their limited remedial procedures, however, only addressed the elimination of immediate and long-term explosive gasoline vapors:

> Finding the source of the leakage and correcting the trouble does not immediately eliminate the seepage or vapor hazard. Frequently pools of gasoline are formed in the ground and after heavy rain storms they continue to flow for several weeks. It might be well to dig a pit near the source of the leakage deep enough to collect the gasoline in the surrounding ground. It could then be pumped out thus reducing the time that dangerous vapors would be present (NFPA, 1941).

Reflecting the constituency of the NFPA, these guidelines focused on the reduction of fire hazard but failed to recognize potential environmental hazards resulting from tank leakage. Absent from the guidelines were recommendations for soil and ground-water clean up. States and localities adopted similar regulations based on NFPA's updated guidelines. In 1948, the state of Illinois included a leaking and abandoned tank provision in the act governing gasoline and volatile oils:

> Underground tanks which develop leaks or which are permanently discontinued in service shall be removed promptly or shall be filled with sand. The sand is to be flushed in with water until a complete sand fill is secured (Illinois Department of Public Safety, 1948:31).

Similar to all guidelines and regulations to date, Illinois' 1948 amendments focused on the control of dangerous vapors. An associated motivation was the recognition that gasoline was a finite resource and that such leakage constituted an economic waste.

In response to the high rate of service station closure in the 1940s, the NFPA expanded their previous recommendations for the abandonment or removal of underground tanks and included these as a separate standard in their 1951 flammable liquids code (NFPA, 1951). Although these new guidelines outlined more extensive procedures for filling abandoned tanks with inert material, they did not adequately address the contamination potential of residual sludges. Even if there was evidence of leakage, the closure requirements remained the same. There was no mention of, or recommendations for, remedial action such as de-contaminating land and water resources. These guidelines and regulations remained the industry standard for another 30 years.

A surging post-war economy created a boom in the number of gasoline stations from 1950 to 1970. New service station design favored larger but fewer stations, and curbside pumps were now relicts (deChazeau and Kahn, 1959:364). Many of the "two-pump" service stations that were common prior to 1950 went out of business during this time period, replaced by multi-grade stations with several pumps and larger tanks (Hogarty, 1981:33). Cheap energy, intercity highways, and suburban sprawl thrust automobiles and gasoline stations into a critical role in modern American life. The number of service stations steadily increased and their locations shifted to capitalize on the daily automobile movement from central business districts to suburbs via highways.

The total number of stations operating in the country peaked in 1970 and has sharply declined ever since. The major factor prompting this decline was the oil embargo and associated gasoline shortages of the mid-1970s which caused petroleum marketers to close marginal stations. The economy improved by the early 1980s, but the move toward self-service stations caused continued closure of the larger full service stations of the 1950s and 1960s. Finally, emerging environmental hazards forced a reconsideration of the industry guidelines that had been in effect since the first half of the twentieth-century. Insurance companies demanded owners take more extensive precautions against environmental mishaps and forced many owners of older stations to consider closure (Smedley, 1989).

2.3.3 The Pattern of Underground Storage Tank Locations

The number and location of USTs that have been installed in a given community are inextricably linked to the historical development of gasoline marketing practices and the morphological evolution of land use patterns in that community. Richard F. Lamb (1985) constructed a model of land use change in small-town commercial districts. His model is useful for anticipating the locations

of USTs that changed in relation to gasoline marketing strategies over time (Fig. 2.5). Gasoline outlets that operated prior to the 1920s tended to locate in and around the periphery of the early central business district (CBD) in conjunction with existing business establishments. By the late 1930s, most of these outlets converted to other uses and are now covered by new buildings and land uses. It is rare to find an operating station or secondary business (e.g., parking garage) selling gasoline in this zone.

Stations constructed during the first boom (1920-1940) operated in the early auto-oriented expansion zone, primarily along major thoroughfares leading into and out of the CBD. Many of these early stations selected prominent corner lots at important intersections while some interspersed along block faces with other commercial businesses. Station closures that took place in the mid-1940s, and later in the 1970s, occurred primarily in these early auto-oriented expansion zones. Only a few stations with accessible locations survived. Proximity to the CBD enhances the likelihood that these closed stations will be occupied by a variety of commercial reuses. During this same era, a similar zone of expansion extended from the edge of the CBD to the railroad depot or switching yard and usually contained several gas stations. These railroad-oriented expansion zones also contain bulk petroleum storage facilities and are the site of numerous spills related to transfer and distribution. Industrial land uses also concentrated in these railroad-oriented expansion zones, where many businesses installed petroleum and chemical USTs for use in their manufacturing operations.

The gas station construction boom of the 1950s through the early 1970s took place along outlying commercial strip development zones among sprawling shopping malls, discount stores, and auto dealerships that required large tracts of low cost land. Some in-filling occurred between the early auto-expansion zones and strip development areas. This possible mixed-use area may have a few stations scattered among residential and commercial uses. Evidence of the wave of station closures in the late 1970s through the 1980s can be found primarily in these mixed-use and strip development areas.

Ambitious highway construction projects of the late 1960s and 1970s linked many historically isolated towns to the interstate system, either directly, or by an entrance/exit ramp in close proximity. Service station owners tried to take advantage of the relatively high volume of traffic heading for the commercial district by locating outlets at these significant highway intersections and creating a commercial opportunity for passing motorists (Norris, 1987). Highway intersection stations have not been immune to the recent wave of closures and many relicts remain standing at these intersections. As the preceding historical review of gasoline marketing indicates, a community of any size may have a complex pattern of active and inactive underground storage tank locations that represent an environmental hazard and potential liability to future property buyers.

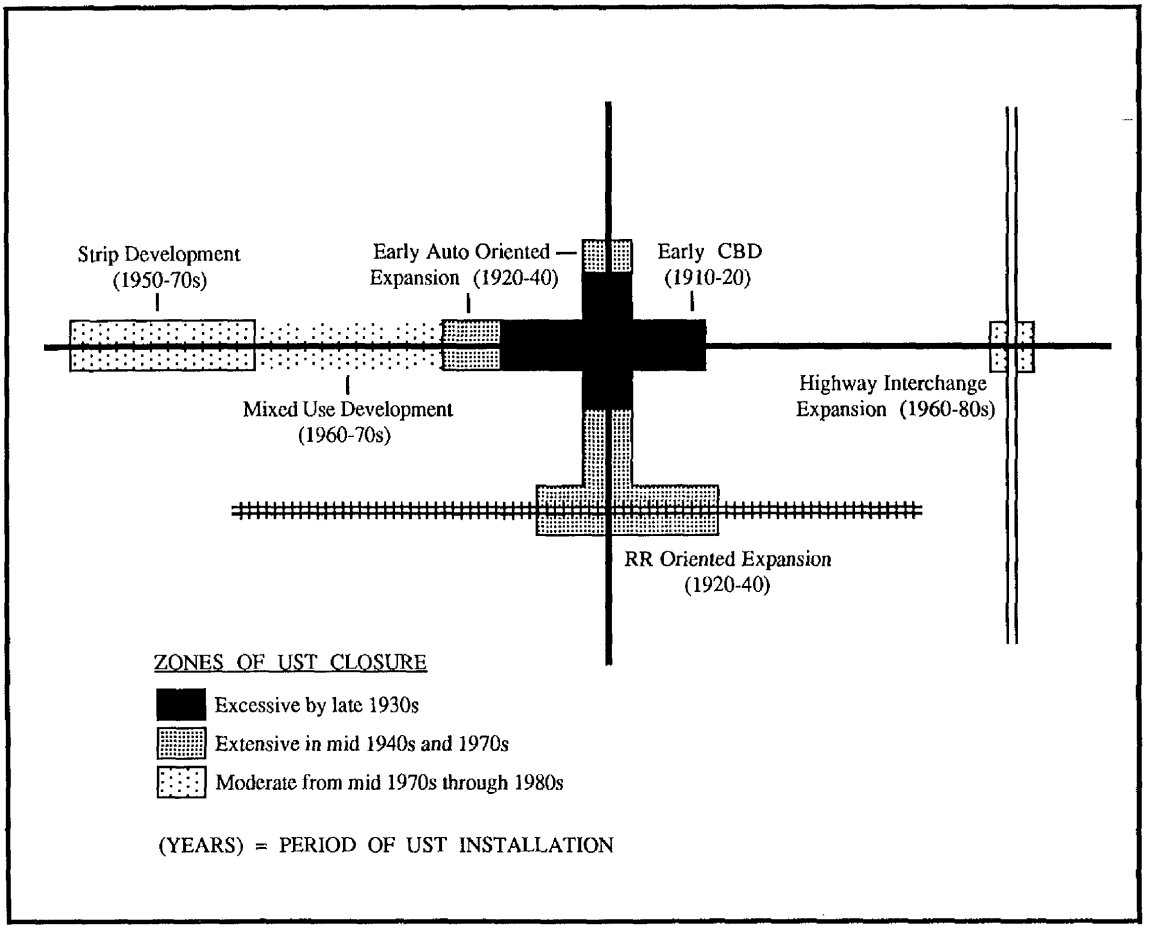


Figure 2.5. Model of Underground Storage Tank Closures. After Lamb (1985).

2.4 Historical Zones of Waste Disposal

The distribution of relict hazardous material accumulation sites is partly a product of the changing geography of industrial activity and also a function of legal requirements. American manufacturing experienced a period of tremendous growth between 1870 and 1970 and in so doing expanded into previously undeveloped areas, while abandoning other sections of towns and cities. With the rise of large-scale factories, there emerged a series of public policies that influenced waste disposal practices. This section will consider the relationship between industrial expansion and waste management policy.

2.4.1 Pre-1870 Waste Management

Prior to 1870, public policy made few distinctions between industrial and general urban refuse. There were state nuisance laws that restricted the release of harmful substances into private and public water supplies and also gave individuals a means to redress obnoxious conditions created by manufacturers (Melosi, 1981; Tarr, 1984). In fact, courts in the nineteenth century generally ruled in favor of plaintiffs who objected to undesirable conditions created by industry (Melosi, 1988). Nevertheless, with the exception of policies that addressed the accumulation of manure in cities and the fouling of watercourses with biological factory wastes, there were few regulations that specified where and how factories could discard their refuse. Consequently, waste disposal followed the path of least cost. This meant factories would heap their solid wastes in low areas on or near their property and discharge liquids into the most convenient waterbody.

Many industries in pre-1870 cities clustered near waterways for access to water supplies and cargo handling facilities or along the emerging rail network. The scale of production was relatively small, and consequently, waste management remained a negligible issue. Industries on low-lying ground used solid wastes to "reclaim" waterfront or marginal property and also to build up their land against possible floods (Sapan, 1985; Ingle, 1982). In many cases, scavengers and manufacturers used the same disposal grounds for discarding mixed urban refuse. Dumps received "night soil," construction debris, ash, and factory wastes. Although there were limited quantities of hazardous materials during this period, industry commonly used a variety of toxic materials. Disposal was limited in its areal extent and concentrations of contaminants were low (Fig. 2.6).

Some cities had constructed sewer systems by 1870, and these carried untreated domestic sewage to waterbodies for dilution, but privies were still common in smaller communities. Factories along waterfronts simply dumped their effluent into streams. Virtually no treatment was offered, although the largest volume of industrial wastes were biological and hazardous only in that they contained populations of disease-causing bacteria that threatened downstream water users (Tarr et al., 1984).

A final factor that relates to pre-1870 waste disposal is the location of extractive activities at the urban fringe. Suppliers of building stone, fired clay bricks, sand, and gravel excavated natural resources in areas just beyond the built-

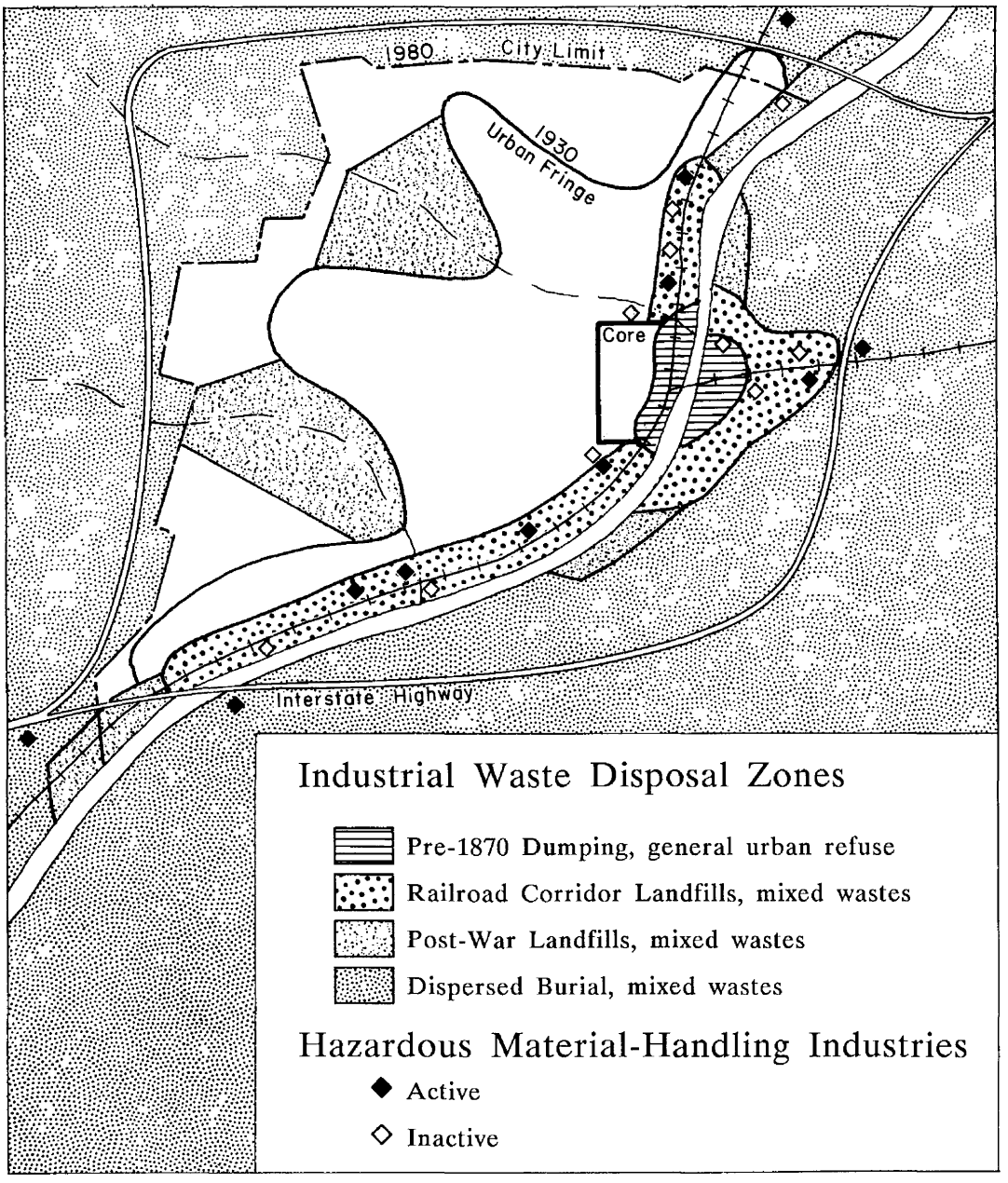


Figure 2.6. Model of Industrial Waste Disposal, 1870-1970. After Colten (1990a).

up areas of cities. As cities expanded, the mining frontier pushed farther out from the urban core, leaving abandoned quarries that were ideal repositories for subsequent waste disposal.

2.4.2 Railroad Corridor Waste Disposal, 1870-1930

Several factors combined to shift the focus of both industrial activity and waste disposal into new zones between 1870 and 1930. Congestion, brought about by the rapidly expanding scale of industrial activity, increasingly expensive land costs, and higher urban taxes drove some manufacturing to areas outside existing city limits. In addition, insurance companies required new factories to adhere to fire-retardant building codes that called for single-story, or land extensive, designs. Smoke abatement and increasingly stringent municipal nuisance regulations worked in conjunction with insurance codes to forbid the construction of new factories producing unwanted conditions in the city limits. These factors forced manufacturers to seek property for new sites at the fringe of urban areas (Stilgoe, 1983; Pred, 1964; Taylor, 1915). Where possible they tried to acquire property adjacent to waterways, but access to rail lines became equally important in site selection. The pattern of industrial activity that evolved between 1870 and 1930 was more expansive as it snaked across the urban fringe along the railroad corridors.

Rail lines often followed the gentle gradient of streams, and consequently, factories built on floodplains subject to periodic inundation. To alleviate risk of flooding, industries creating solid wastes used the material to raise their sites or to build levees (Colten and Samsel, 1988). Factories on lakefronts and seashores expanded their operations out into the water by using wastes to create "made land" (Colten, 1985). Industrialists reclaimed hundreds of acres of land with their solid wastes. Although much reclamation occurred on land they owned or on nearby property, increasingly dispersed sites were used, particularly if abandoned quarries existed in the vicinity. In such situations, it was common for industries and municipalities to dump mixed wastes in available disposal sites. There were virtually no guidelines or regulations guiding the disposal of industrial solid wastes outside of city limits during this period, nor were there laws dictating how former disposal sites could be used in the future.

Liquid wastes received much greater attention from legislative bodies and public health authorities during this time span. Leal (1901) cited Illinois as among the states with the most "advanced" water pollution laws in the country. Although the Illinois statutes attempted to protect all waters, and not just drinking water supplies, enforcement relied on injured parties taking legal action against polluters. In 1911 the state created a commission with the specific duty of halting pollution, and it vigorously sought to restrict industrial pollution of waterways (Illinois Rivers and Lakes Commission, 1913-16). The commission faded from active status during World War I and polluted conditions reached unprecedented levels during the 1920s. Virtually no industrial effluent received treatment prior to entering waterways and there were significant accumulations of sediments in some streams (Hoskins, 1927:10).

Railroad corridor disposal sites received large volumes of hazardous materials that were disposed of in an unregulated manner (Fig. 2.6). These areas are undergoing extensive redevelopment today and should be given careful consideration as sites of potential hazards.

2.4.3 Industrial Waste Disposal after 1930

The Great Depression had a positive impact in terms of environmental degradation. As production of industrial goods fell, the volume of liquid and solid wastes followed a corresponding downward curve. During the hiatus, the federal government undertook a vigorous program to increase the number of sewage treatment plants. Although these treatment facilities primarily served domestic customers, there was also growing concern with factory wastes. The Illinois General Assembly created the Sanitary Water Board in 1929 and it encouraged manufacturers to install treatment equipment. It achieved limited success by reducing oil discharges to major waterways and convincing some generators of toxic wastes to discharge their wastes to lagoons (Colten, 1990b). Nevertheless, the majority of industrial wastes in 1939 still were either untreated or inadequately treated prior to release to streams (Illinois State Planning Commission, 1939).

Increasing concern with water pollution produced a gradual shift of industrial wastes from water repositories to land disposal sites. As factories and municipalities began to treat a greater share of the total volume of effluent, they created sludges containing concentrations of many of the more hazardous substances formerly dumped into streams. Whether dumped on company property or in nearby low areas, a greater proportion of wastes began to receive land burial (Tarr, 1984).

The volume of wastes rose again during the 1940s as industrial activity resumed to meet wartime demands. During World War II, there was very little progress in the area of waste management. Most of the sanitary engineers left their local positions and served in the military, leaving behind somewhat erratic treatment facilities.

The military's adoption of "sanitary landfills" during World War II reinforced the gradual shift to land disposal sites. Distinguished from dumps by daily packing and covering, sanitary landfills became the favored disposal option during the 1950s and 1960s. Preferred sites for landfills were old quarries or previously undeveloped low ground along small watercourses (Fig. 2.6). Promoters of the landfill claimed they could reclaim unproductive land. Local sanitation authorities and private operators allowed the deposit of all manner of wastes in these facilities.

Federal legislation aimed at cleaning up waterways encouraged the construction of more and more municipal sewage treatment facilities during the 1950s and 1960s. This legislative approach, however, forced many municipalities to restrict certain troublesome wastes from their expensive treatment plants. Toxic and acidic wastes damaged either the bacteria of the treatment works or corroded the plumbing. Consequently, industry had to continue using waterways to dilute their wastes or construct facilities of their own. Although a greater share of sewage received treatment in 1960 than 1950, waterways were still severely polluted and sludges found their way to landfills.

Many post-war landfills reached capacity during the 1960s, and a second generation of larger, rural landfills replaced the first generation of disposal sites. Dispersed rural land was the preferred setting for these facilities (Fig. 2.6). There were few restrictions on what these landfills could receive, and consequently, cities and private contractors dumped a mixture of hazardous and non-hazardous materials in them. Although the potential for ground-water contamination was recognized, there have been numerous instances of landfill leachate fouling private and public drinking water supplies (Herndon, 1983; Burmaster, 1984). Poor design or site selection contributed to this situation.

Most importantly, there has been a tremendous outward growth of urbanized areas during the post-war years. Residential and commercial developments have engulfed former waste disposal sites and exposed unsuspecting populations to hazardous materials. Inattention to past land uses is the primary cause of such situations.

CHAPTER 3. SITE HISTORY PROCEDURES

There are many environmental services that include at least some rudimentary site history preparation, and terminology is somewhat confusing. Site audits, site assessments, property transfer evaluations, and pre-acquisition site assessments are terms used to describe due diligence investigations. By whatever name, these are the primary tools used to document environmental conditions prior to property transfer and generally require at least a basic review of past land uses.

Most guidelines describing site assessment procedures divide the project into two phases (see Appendix E, Site Assessment Techniques). Phase I includes the site history, site geology, a search of relevant state, local, and federal agency files, and a site inspection. This level of research requires specialists with training in historical research methods, geology, individuals familiar with environmental agency files, and engineers knowledgeable in industrial processes. If the phase I component turns up evidence of past hazardous material-related activity, a secondary investigation is recommended, or the phase II may be carried out simultaneously. The phase II may include a variety of environmental tests to determine the exact location and composition of contamination. A site assessment that proceeds to the second phase demands specialists from a variety of backgrounds such as geology, chemistry, hydrology, civil engineering, and toxicology. A complete site assessment draws on several specialties and the investigating team should include specialists in each discipline.

This section will consider only the site history and will serve as an overview and critique of existing methods. It will review various site assessment guidelines proposed by professional organizations and state governments, review the findings of interviews with practitioners in Illinois, and present recommended procedures for thorough investigations of site histories. The emphasis on historical methods and the historical shortcomings of many of the recommended procedures does not imply that they are lacking in other components of the site assessment.

3.1 Industry Standards

The site history should document past activity or land uses associated with hazardous materials on a given piece of real estate and nearby properties that may have impacted the parcel in question. Many procedures recommend tracking ownership to establish particular types of industrial activity, but there is some disagreement on the effectiveness of a title search. Some claim that ownership provides poor evidence of activity and that it is too costly and time consuming for a phase I investigation. There is also lack of consensus on the length of time that should be investigated. A common recommendation is a title search that extends back 50 years, although others hold that activity, not ownership, needs to be traced 60 years, from initial development of the property, or from initial settlement.

A review of ten guidelines revealed a wide range in the types of records consultants may review to establish due diligence (Fig. 3.1). A total of 22 different categories of records appeared in the various guidelines. All but one suggested a review of environmental agency files and all but three pointed out the

Source	Guidelines										
	ASFE	Connelly	White	Payne	FNMA	ISGS	U. Illinois Chicago	Stirling	Connecticut	New Jersey	
Title	X		X		X		X			X	
Fire Insurance Map	X		X			X	X	X			
Topo Maps	X	X		X	X	X	X	X	X		
Air Photos											
Environmental Agency	X	X	X	X	X	X	X	X	X	X	Level 1
Directories			X	X		X	X	X			Sources
Plat Maps						X	X				
Census Records											
Public Health/ Sanitation	X	X	X	X	X	X	X		X	X	
Labor Agency											
Planning/Zoning	X		X		X	X	X	X			Level 2
Military											
Building Permits				X			X	X			Sources
Local Fire Department	X	X	X		X			X		X	
Emergency Services											
Technological Publications								X			
Library/ Historical Library	X		X					X			
Newspapers	X			X							Level 3
Court Records										X	
Interview	X			X				X			Sources
Company Records	X			X	X			X		X	
Historical Agency/ Archives											
Other	2	2	2	0	0	2	1	0	2	0	

Figure 3.1 Commonly Used Site History Sources. Compiled by Authors.

value of either aerial photographs and topographic maps. Other commonly cited sources included local public health agencies (8), the local fire department (6), planning agencies (5), fire insurance maps (5), and company records (5). The most extensive listing comprised 13 different sets of data; the average number was 8.2.

Guidelines generally recommend that the site assessment include property surrounding or adjacent to the site being investigated. There is no standard for the size of an area to investigate as a buffer.

In terms of what work is carried out in each phase, recommendations vary widely. The most common prescription is that phase I investigations consist of the site history, site geology, the regulatory compliance check, a site inspection, and interviews. In practice, some lending institutions are calling for environmental testing during the phase I. Others are breaking the process into three phases. Given the absence of consensus in methodology, it is not surprising that Bennett (1989) has argued that there should be a national standard for establishing due diligence. Nevertheless, a national standard may be a remote possibility given the diversity of approaches followed by national organizations. A review of the historical components of some of the major guidelines follows.

Due to its widespread participation in lending activity the Federal National Mortgage Association (FNMA or Fannie Mae) published guidelines for a two-phase environmental hazards management site review (FNMA, 1988). It offers a checklist that qualified consultants are to complete prior to the property transfer. The phase I segment is to "quickly determine whether information currently exists to clearly evaluate a property's environmental status" (FNMA, 1988:3). If phase I indicates that there are potential environmental problems, a phase II is required and includes sampling and analysis of various environmental contaminants. The preliminary investigation requires consultants to consider whether the property has asbestos, polychlorinated biphenyls, radon, underground storage tanks, waste disposal sites, lead paint, or urea formaldehyde. It calls for a review of some standard source material, specifically aerial photographs, building plans, property title, environmental and health agency files, and land use maps (FNMA, 1988). The UST survey asks if there are active tanks on site or if there is a current survey that indicates the property is free of USTs. Likewise, the polychlorinated biphenyls checklist asks if there are transformers or capacitors on the property.

Representative Weldon of Pennsylvania has circulated a draft amendment to the Superfund law. It spells out his concern with establishing a standard "Phase I" environmental audit conducted by environmental professionals (engineers, environmental consultants, and attorneys). The proposed phase I investigation would consist of a survey of land ownership, commercially available aerial photographs, federal, state, and local environmental clean up liens against the property, and reasonably obtainable federal, state, and local records of existing and potentially contaminated sites. The Weldon amendment emphasizes efficiency by using such descriptive phrases as "easily accessible."

The Mortgage Banker's Association (MBA) has commented on the proposed "Weldon amendment" to CERCLA. Its interests lie in establishing a voluntary

minimum standard to avoid legislation that will impose rigid guidelines. The MBA fears federal lawmakers might create conditions that would interfere with the efficient completion of transactions.

The ASFE/The Association of Engineering Firms Practicing in the Geosciences (1989) has prepared a set of recommended procedures for conducting "pre-acquisition site assessments." Its list of public and historical records is far more extensive than those proposed by Fannie Mae, and it calls for much more thorough investigations. In addition to the records typically used by engineers such as agency files, aerial photographs, and permits, the guidelines call for a review of company records, newspapers, libraries, historical societies, historical maps, and "Sandborne" [sic] maps. The ASFE guidelines also point out much of the site assessment research is not a traditional engineering service, and it encourages firms to employ "qualified staff" and emphasizes that "other disciplines and expertise are required to do the work well" (ASFE, 1989: 3).

White (1984) developed a three-phase procedure designed to identify unknown sites which places the emphasis on pre-1970 historical sources. His methodology inverts the more common approach of looking at recent activity first and is quite distinct in that it does not rely on regulatory agency files. Rather, it complements many of the other methods by seeking to discover activity unknown to regulatory agencies.

States that have enacted laws requiring site investigations also have a range of expectations for due diligence reports. New Jersey, which passed the first state legislation of this type in 1984, requests a history of ownership and operations since 1940 and all environmental permits since 1960 (New Jersey Department of Environmental Protection, 1989). While the New Jersey law applies only to sizable pieces of industrial property, it requires a large amount of information, without which property transfers can be blocked. Connecticut has issued a Transfer Act Site Assessment Guidance Document (Connecticut Department of Environmental Protection, 1989). It calls for a review of pertinent activities and suggests sources for compiling a site history. The list of sources it recommends includes some critical historical documents such as public health agencies, aerial photographs, and local fire department files.

There is great inconsistency in what is expected as a site history. The range of years that are covered and the sources consulted varies tremendously. From the perspective of a historian, few of the guidelines offer a satisfactory means to document adequately past hazards-related activity.

3.2 Illinois Interview Results

Museum staff sought out individuals involved in all phases of property transfers to assess current understanding of the state law and gauge the evolving standards for due diligence investigations. We interviewed individuals employed by lending institutions, environmental consulting firms, and real estate companies. Their responses to our questions indicate a fairly widespread familiarity with both the new state law and the potential liabilities associated with contaminated property. There is confusion about who must file disclosure documents and some frustration with the availability of necessary information. Also, individual realtors and bankers seem content to let their trade organizations and the consulting profession work out the particulars of site investigation procedures even though they run the greatest risk. Although there was some dissatisfaction with the IRPTA, the general attitude was one of "wait and see," to allow the business and regulatory communities time to assess the bill's effectiveness over a period of years.

Museum personnel developed a list of potential interview subjects by reviewing correspondence files from consultants requesting information on historical waste disposal practices and research techniques. Additional contacts derived from lists of state wide professional organizations with interests in real estate development. An initial mailing went out to 68 individuals and organizations (Appendix C). It explained the nature of the research project and requested the name of an individual who might serve as an interview subject. Follow-up letters went out a month later to 35 individuals who were either on the original list or were recommended by respondents to the first mailing. Based on the responses to the two mailings, museum staff contacted potential interview subjects. A total of 19 interviews were conducted. To augment the face-to-face interviews and to gain input from out-of-state practitioners, ten interview forms were mailed to professionals outside of Illinois. Three responses reached the museum. Consequently, 19 completed interview forms constituted the in-state response and three out-of-state completed questionnaires made up the balance of the 22 responses.

Museum staff developed the questions with input from staff from the HWRIC (Appendix B). The design of the questions allowed respondents to comment at length on their understanding of the IRPTA. Interviews were tape-recorded and responses summarized for final analysis. The conversational nature of the interviews precluded simple answers. Consequently, it was impossible to tabulate yes/no answers or to tie the responses to numerical scales indicating agreement or disagreement. We sought to find the shades of grey between the more clear cut, but less informative, black and white answers. The intent was to discover areas of weakness in the IRPTA and the site history process. By allowing respondents full expression in their answers, we found numerous areas of ambiguity and potential weaknesses in the current process of documenting site histories.

3.2.1 Real Estate Professionals

Seven in-state real estate professionals provided responses. These included individuals working for private for-profit companies, not-for-profits, municipalities, and state government. In general they were familiar with both the liabilities

associated with CERCLA and SARA and with the Illinois Responsible Property Transfer Act (IRPTA), although there was confusion about who must file disclosure documents and what a site assessment should consist of (largely because there is no clear standard for what constitutes due diligence).

Individuals involved in real estate transactions unanimously indicated they would insist on environmental assessments on a broader range of properties than called for by the IRPTA, including adjacent or nearby parcels. Some indicated they were concerned about businesses that formerly handled hazardous materials, and others indicated they felt reviews were necessary on all property. They also made it clear that they would not be satisfied with a site history that did not span a period of time that greatly exceeds the regulatory records that the IRPTA disclosure document reporting process refers to.

In terms of what they considered an adequate site history, there was no uniform view. Most real estate professionals felt the procedure should be left up to the consultant, although some have procedures in place to conduct preliminary screenings in house. They responded that they would turn to engineering or environmental consultants and gave no indication they felt specialists were needed to conduct the site history. They were most concerned with the reputation, the reliability of the product, and efficiency of the consultant rather than specialized training of its staff. None indicated that they had experience with firms specializing in historical research.

They also indicated they felt that computer access to government files such as permits and site inspections would facilitate the preparation of site assessments. In sum, they gave support to the IRPTA by indicating that they felt it would help protect innocent property buyers. The general response was that the disclosure document procedure was ineffective, given the fact that it did not include sufficient types of sites, but the passage of the Illinois legislation made more practitioners aware of environmental liabilities.

3.2.2 Consultants

Museum staff selected consultants who have been engaged in preparing site histories and tried to obtain responses from firms representing a variety of specialties and sizes. Eight responses from companies conducting business in Illinois constitute the basis for the following discussion.

Like real estate purchasers, consultants felt that the IRPTA does not require an adequate range of transactions to report on past activity. Unanimously they reported that they counseled clients to prepare site histories on a much broader range of sites than the IRPTA calls for, and they also generally advise clients to seek information that predates 1970. They also expressed concern with potential contamination from neighboring property.

There seems to be little hesitation for consultants to undertake historical research without training in that specialty. Only one firm had a trained historian on staff (and its specialty was historical research), and two have subcontracted with

specialists when historical information was called for. Otherwise, consultants generally rely on individuals with training in engineering or environmental sciences. They indicated training was important in selecting staff, but suggested that on-the-job experience was more important and that the ever-changing nature of environmental consulting necessitated staff with broad backgrounds.

In terms of obtaining information about past land uses, consultants reported that government agencies were cooperative in making files available. Nevertheless, there was widespread frustration with the length of time required to obtain site specific information. Consultants insisted this situation resulted from staff shortages and insufficient funding and not an uncooperative attitude at the various agencies. They wholeheartedly supported the development of computerized access to agency records for site reviews. Consultants replied that property owners were forthcoming with information about past activity, but expressed an uneasiness with this information because recent, short-term owners frequently could not relay adequate accounts of historical land use.

Also, like real estate purchasers, consultants felt that the IRPTA in and of itself would provide little protection for innocent property buyers, but that it would ultimately offer some security by forcing more people to become aware of the CERCLA and SARA liabilities.

3.2.3 Lending Institutions

Bankers, a mortgage broker, and a representative from an mortgage insurance firm provided a perspective from the lending community. The majority of respondents felt that a broader range of sites than required by the IRPTA deserve site assessments and some require assessments for property adjacent to industrial or landfill sites. They mentioned specifically commercial and idle industrial property, but included most other types of "income" property. As other respondents, they agreed that the issue of when to conduct a site assessment depended on many variables related to the property's past and not just current activity.

Lending institutions rely on consultants to prepare site histories, although there are some in-house efforts to conduct preliminary screenings and make site visits. National organizations are preparing guidelines that individual institutions follow (e.g., Mortgage Bankers Association). All those who responded to the query about what special training they looked for in a consulting firm indicated they turned to companies with engineering skills. There was an underlying interest in hiring credible firms with specific skills. The interview subjects generally agreed that computer access to regulatory agency files would speed up the site review process and thereby facilitate property transfer.

In terms of the impact of IRPTA, there was qualified support of the present legislation. Most felt it would offer limited protection and protect innocent property buyers primarily by alerting them to the potential environmental liabilities. Lending institutions are demanding far more rigorous site assessments and are driving the investigations into past land uses.

3.3 Shortcomings of Current Site Histories

The many different guidelines for conducting site assessments reflect uncertainties about the definition of "all appropriate inquiry" and who the courts will determine are "innocent landowners." There is no consensus, and consequently there is great variability in the published guidelines and in practice as indicated by the interview subjects. Lack of input by those with training in history, we feel, has allowed certain shortcomings to creep into the historical component of site assessments. To avoid the institutionalization of these weaknesses, we offer the following critique of current site history procedures.

Both our review of published guidelines and interviews indicated that many engaged in site assessment work have minimal familiarity with useful historical documents. Of the 22 sets of historical information shown in Figure 3.1, the published guidelines completely omitted four. More importantly, only three or fewer mentioned the extremely valuable documents such as technical publications, local court records, plat maps, historical collections, and newspapers. Greater reliance is placed in face to face interviews and company records. From the vantage point of experience, these sources are imprecise for long term activity and frequently are non-existent. Based on a mail survey of over 200 businesses in Rockford, Illinois, museum staff were able to reconstruct at least 40 years of waste practices for only two companies. Follow-up inquiries to several companies prompted responses that indicated older records had been destroyed, that new management had no knowledge of the practices of former owners, and even when they had some recollection, they were unable to recall specific activities. Relying on such knowledge is akin to using hearsay evidence in a courtroom or secondary sources in historical reporting. In neither situation is this evidence judged satisfactory without first-hand corroboration.

Individuals conducting site histories are seldom specialists in this type of investigation. Specialized training and experience bring a higher level of expertise to any enterprise as reflected by certification procedures in many fields. Mauch (1989 and 1990) has argued that engineers are not suited to many of the research tasks of site assessment work and an engineering guideline concurs (ASFE, 1989). Specialists can bring critical analytical skills to the evaluation of historical documents and also greater degree of efficiency. Environmental consulting firms could improve the historical components of site assessments by subcontracting that portion out to a specialist, or bringing in a specialist to train their staff or to evaluate their historical research.

Each component of site assessment requires specific skills. Those with training in engineering can best perform engineering functions, while those with training in historical research methods can best complete that component. It is expected that law clerks and paralegals may do much of the leg work in a law firm and that engineers-in-training may execute tedious calculations or drafting; nevertheless, individuals with advanced education train, supervise, and ultimately, evaluate their work. The same standards should be applied to historical research.

Most site histories rely heavily on government agency files (see FNMA, 1989) and do not follow a research method designed to uncover unknown sites (although many site assessments rely on environmental testing to perform this function). The extreme gap between the known number of hazardous material sites and the number of suspected sites undermines the reliability of these sources (U.S. GAO, 1987). The most commonly consulted regulatory agency files dealing with hazardous materials date from the late 1970s and have little information about activity prior to that date. The primary responsibility of these agencies has been to inventory active producers of hazardous materials, and this they have done well. They rely chiefly on industry-reported sites and fail to reflect activity carried out by now defunct businesses (Colten, 1988). It is unreasonable to rely on these sources, particularly when there are other documents that can provide an adequate history of land uses at a given site. Furthermore, as is well known by most engaged in site assessment work, many government records are extremely difficult to obtain within a reasonable length of time. Freedom-of-information requests often take weeks to process and agencies are facing an increasing number of requests, which will only mean greater delays. In terms of both historical information and efficiency, regulating agency files are poor sources.

Although most guidelines suggest that site histories should report on property surrounding the parcel being investigated, they need to prescribe how far out these investigations need to extend. Furthermore, they should specify that greater attention needs to be given to sites up gradient and to those where hazards-related activity took place. Site histories should document former underground conduits such as sewers, drainage tiles, canals, ditches, or other man-made excavations that could have been filled with rubble and thereby serve as routes of rapid movement of leachate from a source of hazardous material.

Given the time constraints of many site history projects, the push for efficiency is understandable. However the emphasis on obtaining quick results may impair the product from the perspective of a satisfactory history. Appropriately trained researchers can make the decisions necessary to gather the needed information quickly and with minimal delay.

The greatest obstacle to efficient site history preparation is not excessive demands for information, but inaccessible information. The lack of computerized data bases delays responses to requests, or as in one state agency, the inability of the personnel to manipulate its own data base, consumes valuable time. Other programs simply do not have staff resources to meet traditional job demands and the newly emerging site assessment data requests. More effective information management would greatly expedite the preparation of all components of site assessments.

The historical component of site assessments can be improved greatly, although they should never stand alone. Site inspections and environmental testing remain essential ingredients of site assessments. Nevertheless, site histories can aid in the completion of these components.

3.4 Site History Procedure

Bennett (1989) has endorsed a "phased in environmental audit." The intent is to provide a standard method to distinguish between property that deserves detailed scrutiny and those that do not warrant the expenditures of a thorough site assessment. He proposes that the phase I work be divided into two sections, Ia and Ib. Phase Ia would include a 40-year title search, government records review, and a borrower questionnaire. Phase Ib would entail a site visit by a qualified investigator. This proposal has merit in that the more costly portion of an investigation, the site inspection, would be omitted if unnecessary. However, if the phase Ia is to defer additional investigations in some cases, the preliminary review should be more thorough.

We propose a "phased in" approach that includes a substantial historical component. We will not comment on the procedure to prepare a site geology, an environmental compliance audit, or environmental testing. The site history should include not just an environmental records check, and owner interview; but it should be based on a complete check of appropriate documentary evidence (and title search when deemed appropriate). The proposed method moves from sources of information that are systematically collected and provide nearly universal coverage, thereby ensuring efficiency in the initial stage, to records that are also widely accessible, although locally collected and highly variable in consistency (see Appendix A). Moving to level three sources entails greater expenditure of time, although the accuracy and detail is generally enhanced. Progressing from level one to level three, the researcher will find more information, but at a cost of greater time expenditures. The principal players in each individual transaction will have to decide how deep the investigation should proceed.

In most level one sources detail is diminished by the fact that they provide information that is state wide or regional in geographic scope -- with the exception of items like aerial photographs, topographic maps, and fire insurance maps. The first level sources (Fig. 3.2) serve as a means to screen large areas efficiently and target smaller areas within a piece of property for more detailed analysis. The second level of historical records provide more detail but require greater familiarity with past land owners or company names. Level two sources should be consulted when evidence in level one documents indicates some historical association with hazardous materials. Movement into the level three sources is guided by fairly well-established evidence of hazardous material-related activity. These sources should be consulted after a basic chronology of past land uses is established. Use of specific sources at all levels depends on the type of property being considered. Information about rural and urban activity may derive from entirely different documents, and familiarity with historical records is essential. Selection of the most effective records is entirely site specific, and we cannot offer an invariable system. Rather, we suggest a flexible means of tracing land uses at given localities that seeks to utilize existing records in an efficient and effective manner.

The first level of research should consult the most accessible and standardized records. This would include systematically collected information such as fire insurance maps, topographic maps, aerial photographs, business directories, land ownership maps, and census records (a more detailed discussion of each record is

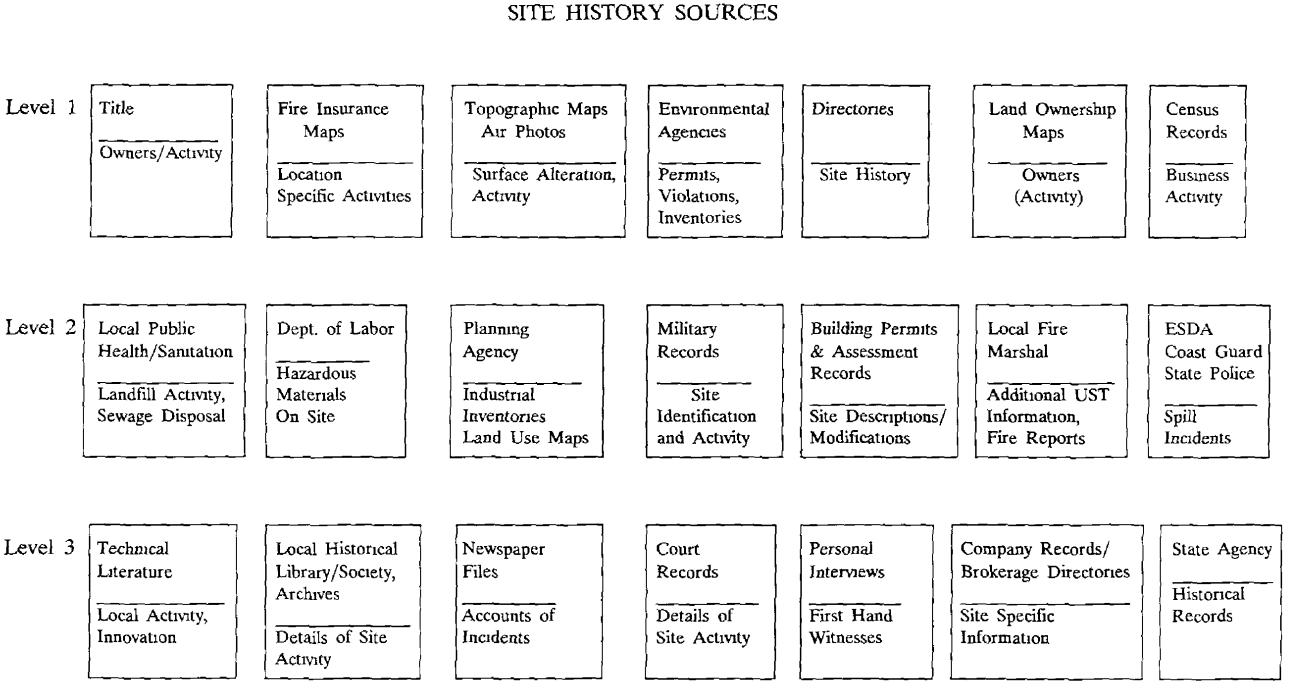


Figure 3.2. Site History Sources.

contained in Appendix A). These sources can provide the preliminary information on land use. Following the recommendations of most standard procedures, phase I surveys should include a title search (we would recommend a minimum of 80-90 years or more in industrialized areas) and environmental agency files for permits and violations at the site (Fig. 3.2). If level one sources fail to indicate any activity associated with hazardous materials, participants in the site assessment would decide whether to proceed with testing or other levels of historical research.

The level one historical investigation should seek to identify activity associated with hazardous materials based on contemporary industrial technologies and waste treatment capabilities. Since no one source can provide adequate evidence of a hazards-free site, multiple sources must be consulted. If there is inconclusive evidence or evidence that some hazards-related activity occurred, a level two investigation should follow.

The level two investigation will proceed from the rough outline of past activity to a more detailed chronology. Level two records yield more detailed information (Fig. 3.2), but they also require more effort. They are more widely scattered in government files and may be less systematic and consistent in their level of detail. Nevertheless, the detail of older records generally surpasses recent environmental agency records and may supply substantial evidence. In the course of level two research, investigators should seek not just indications that hazardous materials were handled on site, but specific ranges of dates, industrial processes, materials, and locations within the property boundaries and adjacent land.

With a refined perspective on activity and if environmental testing is recommended, level three investigations are possible. This level of research will focus on specific incidents and events within the larger chronology of land use. Level three records are the most time-consuming to consult, but hold the greatest promise for detail. These should be consulted when levels one and two indicate there is substantive evidence about where and when hazardous materials were used. This work should precede environmental testing to help pinpoint areas of potential contamination. Personal interviews with individuals familiar with the property, past and present, should also follow extensive research. Without a clear understanding of past activity as indicated by historical sources, an interview may yield little additional information.

Furthermore, researchers should place greater credence on interviews with individuals familiar with past operations and not just the owner. Credibility lies with knowledge of the activity of the site, not possession of the title. A factory foreman or shop custodian will be much more useful as an informant than an owner or site operator.

Selecting which documents will supply appropriate information and guide a researcher to more detailed information demands familiarity with these historical sources. Some will yield appropriate information for urban areas and others will serve as superior sources for rural activity. Figures 3.3 and Figure 3.4 provide a suggested sampling of sources for searches of urban and rural land uses (detailed discussion of the sources is in Appendix A).

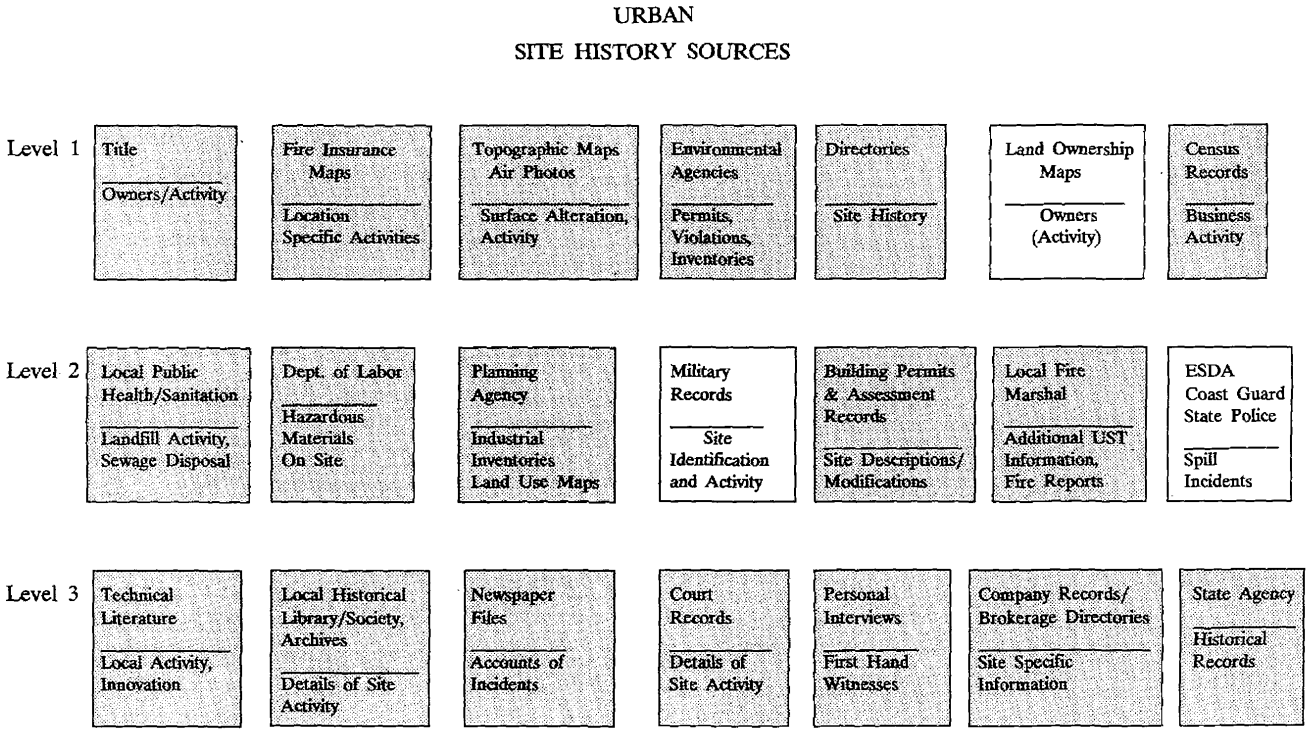


Figure 3.3. Urban Site History Sources. Shaded blocks indicate material that can provide useful information about past land uses at urban sites. See Appendix A for detailed descriptions of these sources.

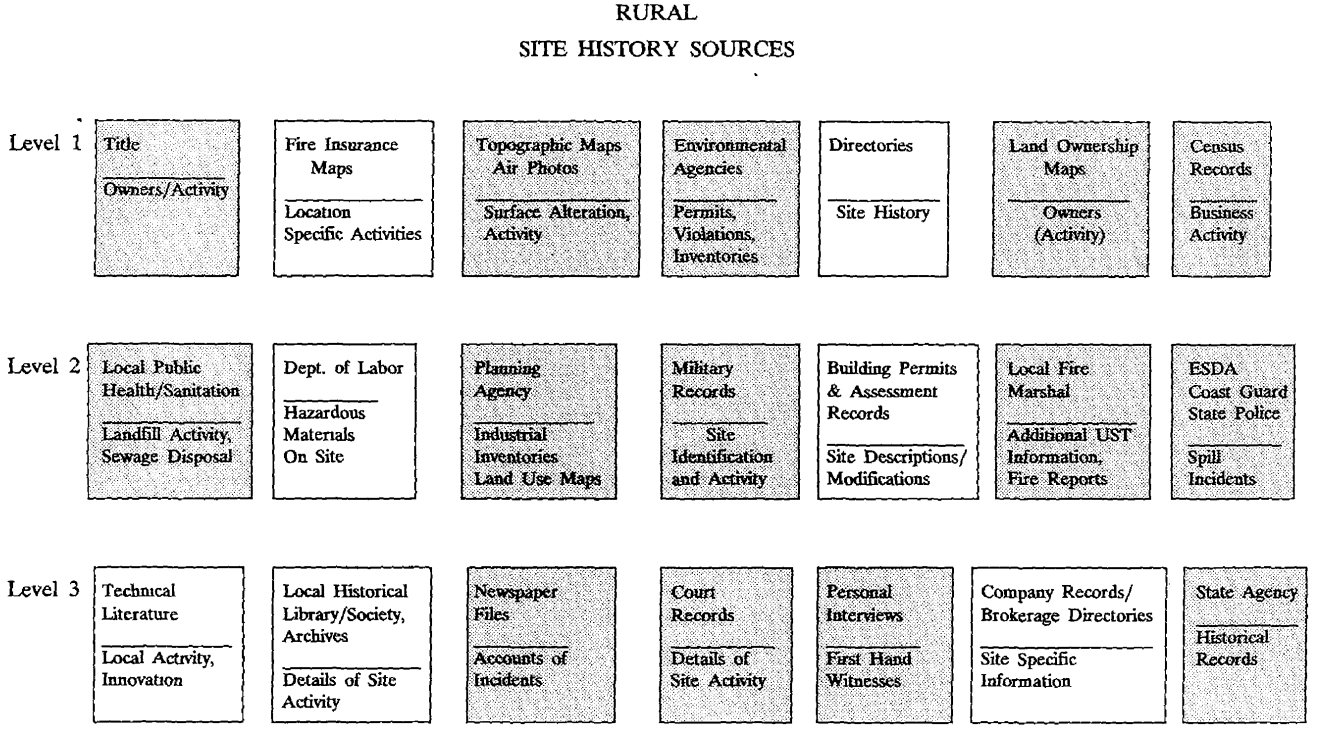


Figure 3.4. Rural Site History Sources. Shaded blocks indicate material that can provide information about past land uses at rural sites. See Appendix A for detailed descriptions of these sources.

3.5 Case Studies

We will offer a pair of case studies to illustrate how historical sources can go beyond simple ownership information and provide details about past hazardous material-related activity. One example deals with a piece of rural property that never served as the site for industrial development. It was adjacent, however, to major oil refineries for more than half a century. The second case study indicates the value of level one sources as a means of supplementing current regulatory agency files. It also points out the value of conducting a city-wide survey for unregistered underground storage tanks.

3.5.1 Grassy Lake

Grassy Lake is a very small waterbody on the American Bottoms near Hartford and Roxana, Illinois and an example of a cattail marsh. Topographic maps and aerial photos reveal it was once larger than its present area of less than one acre. It is owned by Shell Oil Company, although a site inspection revealed that no industrial activity takes place in immediate proximity to the lake (there is an extensive tank farm to the north and west). There were no regulatory agency records of waste generation or storage at the site. Thus, consultation of the records recommended by most professional organizations suggests the site would be free of contamination.

Turning to another level one source, information came to light that suggested further investigations were warranted. A review of business directories indicated that two defunct companies, White Star Refining Company and the International Shoe Company tannery, operated near the former shoreline. Both were in business during the 1920s and 1930s. There were no records regarding activity affecting the lake on file with the state environmental regulatory agency. No level two records indicated any hazards-related activity.

Following normal protocol, the site would appear to be free of hazards. Yet, given the type of industrial activity adjacent to the site and the dates of operation, level three sources were consulted. A review of court decisions indicated that the White Star Refinery had been a defendant in a nuisance suit. The Illinois Court of Appeals heard an appeal of the case and supported the lower court's decision to order an injunction against White Star's dumping refinery wastes into the lake (Shelby Loan v. White Star, 1933). More details emerged in the record of the case heard at the circuit court. Namely, White Star Refinery released its liquid effluent into Grassy Lake between 1919 and the late 1920s. Oil slicks covered the lake surface and deposits of oily sludges four to five inches thick accumulated on the lake bed. Chemical analysis of the sludges indicated that in addition to the oil refinery wastes, chromium from the Hartford tannery also was present. Newspaper accounts reported that several fires raged across the lake surface and consumed much of the surface accumulations during the late 1920s. They also damaged the White Star Refinery (see Colten and Samsel 1988:35).

Both the court records and the newspaper accounts (level three sources) offered specific information about hazardous material accumulations that resulted from the action

of long-defunct businesses. Tracking down court records required knowledge of the businesses that no longer existed and also the period of time that they were in operation. Information revealed in the court records provided the temporal framework for an efficient review of microfilmed newspapers for the years in question.

The historical documents indicated certain sections of the lake bed may contain significant accumulations of oil sludges and toxic metals. Such information normally would lead to sediment analysis.

Additional court records indicated that the International Shoe Company was involved in subsequent court cases that related to its waste lagoons built by the 1940s in Hartford (see Colten 1990b). Given the nature of its chromium-containing wastes, future transfer of its former lagoons should be accompanied by a full site assessment.

This incident offers a brief illustration of historical hazardous material-related activity that created few durable visible traces, but left a significant quantity of hazardous substances and a strong documentary record. Without consulting the newspaper accounts, and more importantly the court records, little would be known about the accumulation of wastes there.

3.5.2 Macomb Underground Storage Tanks

This case study illustrates that a number of former UST sites remain unrecorded because current regulatory reporting requirements are temporally inadequate. Without consulting historical records, many of these possibly contaminated UST sites will not be identified by searches of the State Fire Marshal's UST inventory or through a visual site inspection.

Under the Resource Conservation and Recovery Act (RCRA) amendments put forth in 1984, USTs abandoned or closed after January of 1974 are required to be registered with designated state agencies. In Illinois, UST owners had to register their tanks with the State Fire Marshal by May of 1986 (unless tanks had been previously removed from the ground). Individuals conducting phase I property site assessments usually rely primarily on records maintained by the environmental agency in charge of UST notification forms to identify these sites. However, thousands of tanks that became inactive prior to 1974 are not recorded or readily known to exist. The possibility of contamination at these tanks sites is high. Early laws and recommended standards governing USTs did not address the environmental consequences of tank failure and abandonment (see Section 2.3). In the past, owners did not routinely perform clean ups at sites where tanks had leaked, and unsuspecting purchasers of property with derelict USTs may find themselves liable for costly remedial clean ups.

Using Macomb, Illinois as a case study, a community-wide inventory of active and inactive UST locations confirmed the suspected underreporting of sites. Macomb is representitive of many small towns throughout the state. It primarily serves as an agricultural outpost and regional center for commerce, industry, and manufacturing. Two main transportation arteries, U.S. Route 136 also known as Jackson Street and U.S. Route 67 or Lafayette Street, intersect the downtown

square, running east and west, and north and south, respectively. Over time, commercial activity increased along these two routes, especially along east and west Jackson Street. Major industries concentrated adjacent to the Burlington Northern Railroad that runs just north of the downtown square. Macomb's population grew at a modest but steady rate from the turn of the century through the 1950s and was approximately 20,000 in 1989.

3.5.2.1 Inventory Results

A variety of archival and current sources provided insight into the history and location of USTs in Macomb. Three level one sources contained the most useful and consistent information for reconstructing active and inactive UST locations on a community-wide basis: local city directories, Sanborn Fire Insurance maps, and a list of tanks registered with the State Fire Marshal. In addition, a visual survey of identified UST locations determined which sites would be obvious with a typical phase I site walk-over. Various records (e.g., archival photographs, personal interviews, and Illinois Environmental Protection Agency LUST Section files) outlined throughout the three site history source levels in Appendix A provided parcel specific information concerning USTs but were not useful for constructing the community-wide inventory. Historical aerial photographs (level one), and local fire department records, building permits, and tax assessor records (level two) were expected to hold potential for the inventory, but did not. The scale (1:20,000) and resolution of aerial photos made it difficult if not impossible to pick out former UST locations. Local fire department records on USTs did not exist. Macomb city building permits contained no information on UST installations or removals and their file structure did not facilitate efficient searches by parcel or building permit type. Tax assessor field cards were surprisingly vague and provided no clues as to UST installations. Two of the level one sources were useful for source comparison but did not identify any new sites or provide detail for specific sites. The U.S. Census of Business published gas station statistics for Macomb beginning in 1929 through 1987 at approximately five year intervals. These interval statistics indicated how many stations were operative at specific times. The city planning department had a 1960s land use map that depicted gasoline service station locations although all these sites were identified through city directories as well.

The three sources finally selected for compiling the community-wide UST inventory overlapped during certain time periods (Fig. 3.5) and geographic area which facilitated comparisons among them. Overall, Macomb's city directories provided the most consistent and lengthy coverage of UST activity for a 70-year period beginning in 1922. Thirty-seven subsequent city directories identified virtually all gasoline service stations in Macomb (approximately half of the total UST sites inventoried). It is important to note that city directories needed to be supplemented with other historical sources because they only identify USTs associated with businesses listed under the "service station" heading. The remaining non-gas station UST sites, located at a variety of enterprises, would have escaped detection if additional inventory sources were not consulted.

Sanborn maps provided the only source of information on Macomb's pre-1922 UST sites (Fig. 3.5). Five of Macomb's Sanborn map atlases clearly depict

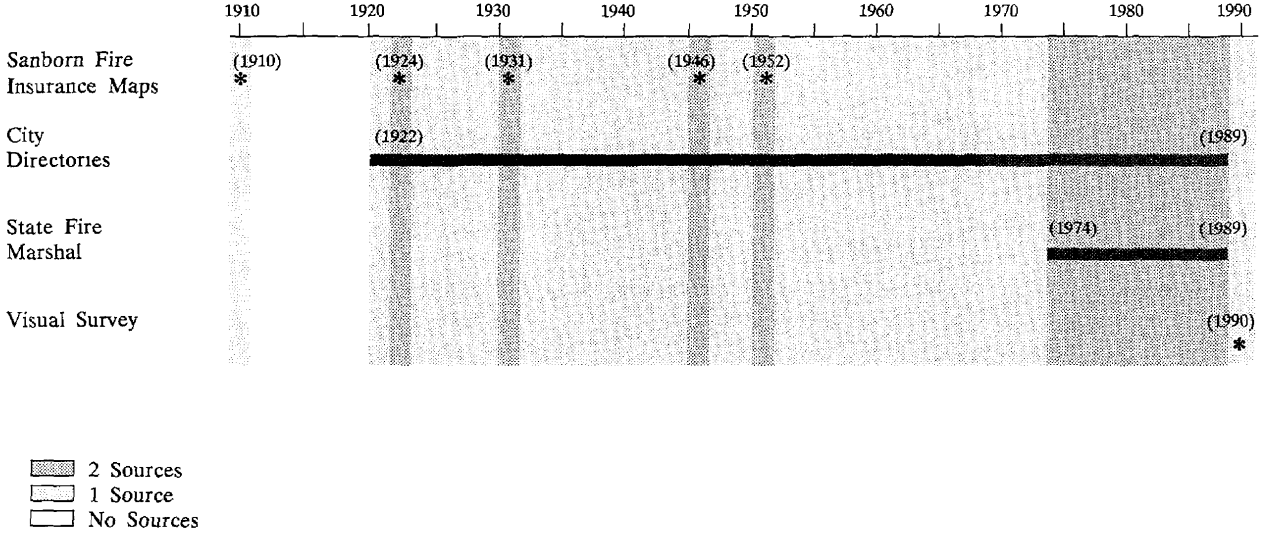


Figure 3.5. Inventory Sources and Years of Coverage. Inventory compiled information on petroleum underground storage tanks for Macomb, Illinois for the years 1910-1989. Stars indicate years of coverage for Sanborn maps and visual survey. Dark bars indicate years covered by directories and State Fire Marshal records. Source: Mulville-Friel (1990).

underground gas tank symbols at gasoline stations and other business establishments. Overall, Sanborn maps identified a total of 50 sites, 17 of which were non-service station locations operating prior to 1974. Even though Sanborn maps were sporadically updated, they included most sites identified by city directories in addition to several unique non-gas station UST locations.

The State Fire Marshal's list of registered USTs proved to be a valuable, but historically limited, source of information because it includes only tanks in operation during the last 16 years (Fig. 3.5). Macomb had 49 UST sites registered with the State Fire Marshal (roughly 48 percent of the total identified.) Sixteen locations that had tanks operating after 1974 had not been reported as required by law; actually, none of the owners of sites operating prior to 1980 registered tanks. In addition, only two of the reported 15 sites with abandoned USTs had them filled with sand or an inert substance. This is indicative that tanks were not always closed by owners according to regulations and industry guidelines.

Only five of the UST locations in operation prior to 1974 (39), and roughly 15 percent of all unreported tank locations (55) were identifiable during the visual survey. A potential buyer, or in some cases the current owner of an unreported UST location, may not be aware that petroleum had been stored on the property in underground tanks. Recent UST regulations have forced many marginal stations out of business, and there has been a rush to obliterate old gas stations. Derelict UST sites that are visually obvious now may not be in the future.

3.5.2.2 Location of Underground Storage Tanks

As a result of 80 years of underground petroleum storage, communities have pronounced geographic patterns of potentially hazardous UST locations, and a review of historical sources can facilitate their documentation. The propensity for gasoline station deactivation prior to the 1974 UST reporting requirement, and their subsequent reuse and adaptability to other types of businesses, increases the likelihood that the parcel's former land use will go undetected. Their interspersion with residential and other susceptible land uses, as well as proximity to man-made conduits such as sanitary sewers and basements, makes them especially dangerous if underground tanks leak.

In Macomb, some of the first gasoline stations concentrated around the downtown area, while others established near the railroad tracks to take advantage of tank cars and bulk storage facilities. Eventually, gasoline filling stations spread out along the main traffic thoroughfares of Jackson and Lafayette streets. Many of these stations displaced residential homes to acquire corner lots with superior access and visibility. Non-gas station UST locations scattered throughout various sections of the city depending on the nature of their business. The majority of unregistered UST sites are located in and around the central business district. A visual survey did not identify these sites; historical investigation established their existence (Fig 3.6). All but one of the service stations, located within a block radius of the downtown square, have been converted to other uses, and only two other downtown establishments that stored gasoline have visual remnants of ever having done so. More stations remained open further from the downtown, and those abandoned in these areas tended to be visually obvious.

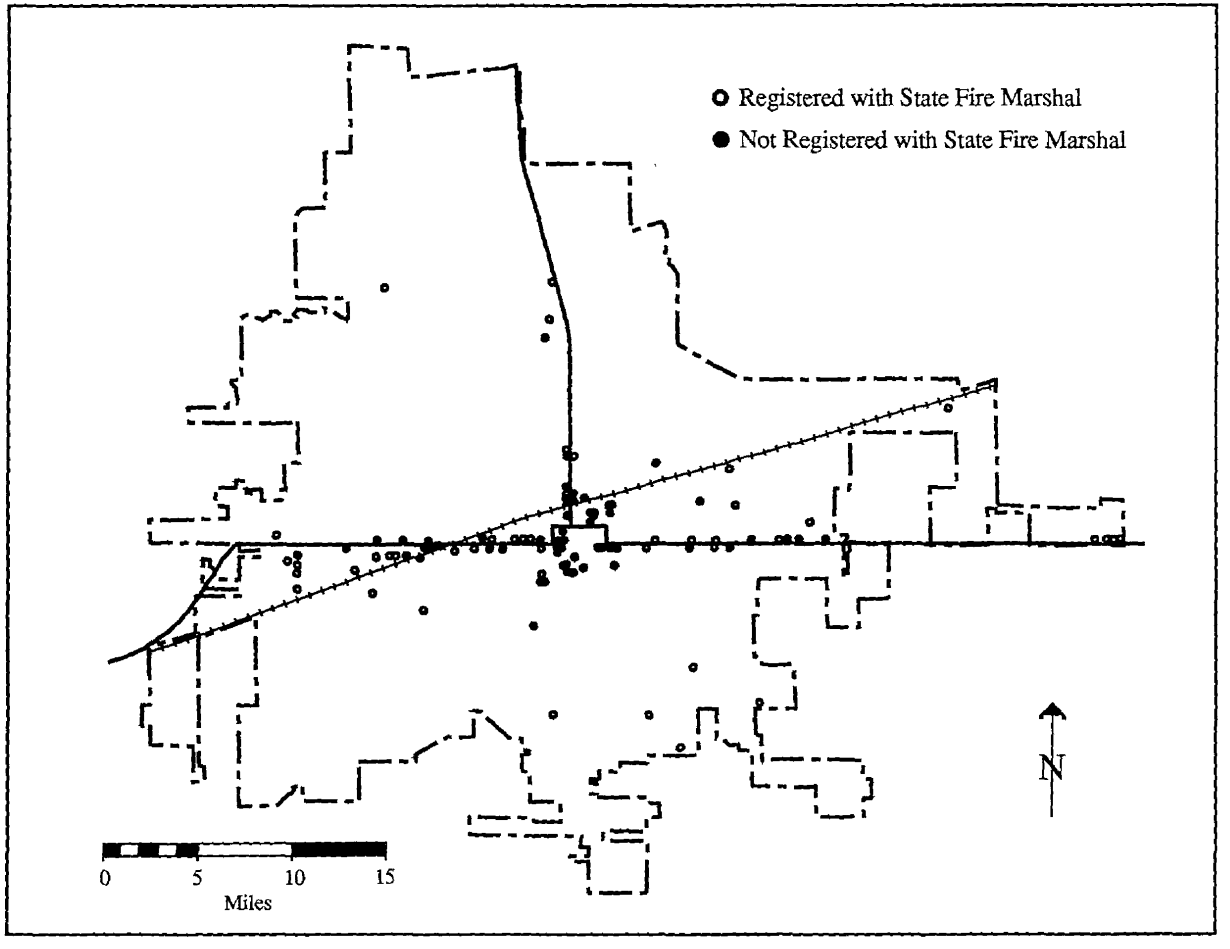


Figure 3.6 Underground Petroleum Storage Tanks in Macomb, Illinois.

The Macomb case study illustrates the temporal weaknesses of current UST reporting requirements in Illinois. Relying on a single source of UST information will result in a serious underestimation of the true magnitude and distribution of tank sites in any community. There is a possibility of contamination at locations where USTs have operated, and less than half of the sites identified in Macomb were registered with an additional 15 percent of tank sites being visually obvious. The omission of pre-1974 USTs from reporting requirements has grave implications to those potential property buyers or lenders who only conduct a visual site investiagtion and check with the State Fire Marshal to see if underground tanks ever existed on the property. Consulting historical sources can reduce the uncertainty associated with unreported and abandoned UST locations.

CHAPTER 4. CONCLUSIONS AND RECOMMENDATIONS

This chapter will offer some conclusions based on a review of historical hazardous waste management practices and an analysis of site history procedures. A second section will discuss recommendations for improving this important component of site assessments.

4.1 Conclusions

The Illinois Responsible Property Transfer Act (IRPTA) does not offer buyers of contaminated property any legal defense in terms of the due diligence provisions. The Illinois legislature has specifically stated that the disclosure document shall not serve as "all appropriate inquiry." In terms of achieving its stated purpose of informing property buyers of "existing environmental liabilities," it may fall short. Current industry standards, as driven by the lending industry, demand far greater documentation of environmental conditions. The IRPTA relies on owners' statements to establish a clean bill of health, even though this generally implies a short-term (20-30 years at best) record of hazards-related activity.

A secondary reason for the passage of IRPTA was to avoid more onerous legislation that would create delays in real estate transactions and also call for administrative costs. While it may achieve this goal, it creates an unnecessary step for individuals and businesses involved in transactions. All sites that must file under the IRPTA will also have to prepare due diligence site assessments. These reports will contain far greater detail about a site's environmental condition, and thereby will serve as a far better source of information. Those involved in property transactions could avoid extra effort if either the disclosure document were brought into line with current industry standards or if IRPTA allowed for the submission of acceptable site assessment reports in lieu of the disclosure document. If changes along these lines were enacted, the types of transactions covered by IRPTA would have to be expanded to conform to industry standards. Furthermore, more comprehensive reporting requirements would aid in remediation of contaminated sites.

Site histories are components of due diligence site assessments, although the guidelines we consulted do not reflect a full appreciation for the range of historical sources that can help document past land uses. Illinois' industrial history demands that more complete site histories be prepared. The association of coal byproduct industries, chemical and oil refining, and primary metal manufacturers has produced a huge quantity of hazardous materials. These industries operated for long periods of time free from effective environmental regulation and for the most part discarded wastes in the most convenient spot. This has resulted in widely dispersed accumulations of hazardous materials. Industrial decline and conversion of former factory sites to other land uses are extremely common and are compelling arguments for improving the level of site histories required for site assessments.

To prepare more comprehensive site histories does not imply unreasonable expenditures of time or money. Use of properly trained staff, who are familiar

with the records, can improve on content and efficiency. Thorough site histories can reduce the costs of random environmental testing by identifying specific contaminants and contaminant sites. When used in conjunction with other components of the site assessment, the site history can improve the overall product.

An issue related to efficient data collection, for components of a phase I investigation, is the accessibility of necessary documents. The need for consultants and lenders to gather information from various agencies, such as the Hazardous Waste Research and Information Center (HWRIC), the IEPA, and the State Fire Marshal, will grow rapidly during the upcoming year. Yet, already there is a backlog of requests for information, and agency staff are searching for means to serve the public adequately. Furthermore, there is a mounting demand for use of aerial photographs and fire insurance maps. Public agencies, as currently staffed, are unable to provide information in a manner that is satisfactory to lenders and consultants. There needs to be greater support for information collection, management, and redistribution. Unless additional funding is allocated for this purpose, agencies handling valuable site specific information will be thrown into an even larger logjam. Information needs to be organized in such a manner that staff can search efficiently and retrieve all types of records used in site assessments. This will require greater support for the repositories where public information is housed. Also, historical documents such as fire insurance maps must be protected from overuse and abuse as a result of frequent handling. Ineffective management and distribution of information poses a greater threat to efficient preparation of site assessments than more rigorous standards.

The Illinois Responsible Property Transfer Act has acted to increase public awareness about the environmental liabilities associated with real estate transactions. Improved awareness should be applied to strengthening procedures for documenting environmental conditions, both for the IRPTA disclosure document and due diligence site assessments.

4.2 Recommendations

Illinois should take the lead in developing comprehensive programs to support site assessment research. To ensure that common-sense standards do not interfere with real estate transactions, several fundamental improvements in information management should be made. The following comments point out steps that would provide greater security for property buyers and also streamline the dissemination of information.

1. Improvements in record management, dissemination, and preservation would greatly facilitate both site history preparation, and other components of site assessments.

    a. In the future, disclosure documents may become valuable records of past land uses. A consistent, state-wide system for filing and managing these records is critical to preserving this growing documentary record. There needs to be support for the IEPA and the county recorders to file, maintain, and manage the incoming disclosure documents.

b. Streamlining access to various computerized data bases that contain information from the IEPA and the State Fire Marshal will aid in timely completion of site assessments. There are innovative cooperative programs operating that permit the dissemination of information contained in certain regulatory agency files. Large numbers of demands from private consulting firms are diverting staff from other responsibilities and forcing delays in what could be an extremely efficient system. If existing programs were expanded to include files from all relevant regulatory agencies (IEPA, State Fire Marshal, etc.) and consolidated in one central clearinghouse (HWRIC), information requests could be processed with greater efficiency. Consolidation would require financial support for establishing the necessary staff and for maintenance of the computer files. A user fee, charged to consultants requesting information, would offset ongoing expenses.

c. Historical files from the various environmental and public health agencies should be transferred to a central repository for improved access. Currently, Illinois' historical files are housed in the different divisions of the IEPA and require Freedom-of-Information requests prior to review. Most are either on microfilm or microfiche, some of which are in poor condition, and are not organized for easy access. The Michigan State Archives has extensive holdings from that state's environmental agencies. There, the archivists have indexed the material and can serve site assessment researchers in an extremely efficient manner. By transferring the non-confidential files to a non-regulatory agency, the environmental agency staff can attend to more pressing matters and the records will receive proper care and organization.

d. Other historical records pertaining to hazardous materials should be maintained for longer periods of time than is currently practiced in many agencies. These records include such information as train accidents, pipeline leaks, agricultural chemical handling facilities, and underground storage tanks. Transfer of outdated files to a central archival facility would facilitate future site assessment research.

e. Regional repositories of critical documents such as aerial photographs and microfilm copies of Sanborn maps would greatly facilitate access to those records and also protect the originals from excessive wear resulting from frequent handling. The Illinois State Geological Survey and the Illinois State Library are collaborating on a plan to develop a series of regional aerial photograph collection and this plan deserves support.

f. Encouraging local units of government to document hazardous material accumulations in their jurisdictions or to maintain local files and resources of historical information would be useful to individuals conducting site assessments and would aid in the identification of potentially hazardous sites.

2. Both IRPTA disclosure documents and site assessments should place a greater reliance on documentary sources.

a. Historical records that could provide valuable information about a property's environmental condition have been neglected. Involving professionals with training in historical research in developing research methods, training site assessment preparation staff, or evaluating site histories will improve awareness of these records.

b. Historical documentation can improve the efficiency of the overall site assessment and also be cost effective.

c. By bringing about a greater congruence between the due diligence standards and the disclosure document, property buyers not only will receive more accurate information about the environmental conditions of a site, but they will be able to avoid preparation of separate forms.

d. Incorporating historical information into both site assessments and the disclosure document ultimately will lead to the development of a superior inventory of environmental liabilities. This will reduce the amount of research replication on subsequent site assessments.

3. Efforts should be made to strengthen the due diligence standards and also the IRPTA disclosure process.

a. If protection of the "innocent" property buyer is the mission of both measures, thorough site assessments are essential.

b. By supplying more information about environmental conditions, sellers will improve both lender and buyer confidence, thereby, improving the business climate.

These recommendations are offered as a means of serving the property buyer who seeks to avoid acquiring an environmental liability, the real estate industry that wishes to escape undue delay, and the lending community that desires to evade making imprudent loans. The chief obstacle to making efficient site assessments is access to information. Utilizing appropriately trained researchers, particularly in the site history component, will overcome part of the problem. Effective organization and management of records will alleviate much of the remaining inefficiencies.

REFERENCES CITED

"Abatement of Industrial Pollution in Illinois." 1936. Public Works, 67:18.

American Petroleum Institute. 1980. Underground Spill Cleanup Manual. API Publication 1628. New York: American Petroleum Institute.

_____. 1953. Manual on Disposal of Refinery Wastes, Vol. I, Waste Water Containing Oil. New York: American Petroleum Institute.

_____. 1951. Manual on Disposal of Refinery Wastes, Vol. III, Chemical Wastes. New York: American Petroleum Institute.

American Society of Mechanical Engineers. 1959. Oil Transportation Piping: ASA B31.4-1959. New York: American Society of Mechanical Engineers.

American Society of Planning Officials. 1973. The Design, Regulation, and Location of Service Stations. Planning Advisory Service, Report 293. Chicago: American Planning Association.

ASFE/The Association of Engineering Firms Practicing in the Geosciences. 1989. Preacquisition Site Assessments: Recommended Management Procedures for Consulting Engineering Firms. Silver Spring, MD: ASFE.

Autin, W.J. 1980. Surface Impoundments Assessment Final Report for Louisiana. Submitted to the U.S. Environmental Protection Agency by the Louisiana Geological Survey. Baton Rouge, LA.

Ball, J. 1986. "Soil and Groundwater Contamination at Wood Preserving Plants." Proceedings for the 41st Purdue University Industrial Waste Conference, May 13-15, 1986. West Lafayette, IN, 347-51.

Bean, F.W. 1920. "Laying Out Drives for Service Stations: Installing Pumps and Tanks." National Petroleum News, 12(4):41-45.

Beaton, K. 1957. Enterprise in Oil: A History of Shell in the United States. New York: Appleton-Century-Crafts.

Bedient, P.B., A.C. Rogers, T.C. Bouvette, M.B. Tomson, and T.H. Wang. 1984. "Ground Water Quality at a Creosote Waste Site." Groundwater, 22:318-29.

Bell, A.H. 1957. Brine Disposal in Illinois Oil Fields. Illinois State Geological Survey, Circular 244. Urbana, IL.

Bennett, M.J. 1989. "Environmental Due Diligence: An Evolving National Standard." Toxic Law Reporter, 3(40):1262-66.

Berger, J.C., and E.P. Castoria. 1988. A Manager's Guide to Environmental Compliance. Chicago: Apland and Associates.

Besselievre, E.B. 1952. Industrial Waste Treatment. New York: McGraw-Hill.

_____. 1931. "The Disposal of Industrial Chemical Waste." Chemical Age, 25(December):516-18.

Brandt, A.D. 1947. Industrial Health Engineering. New York: Wiley and Sons.

Burmaster, E.E. 1984. "The History and Extent of the Groundwater Problem." In Groundwater Pollution: Environmental and Legal Problems. Edited by C.C. Travis, and E.L. Etnier, 45-62. Boulder, CO: Westview.

Carpenter, L.V., E.W. Klinger, and G.R. Pyle. 1934. "Effects of Road Oils and Tars on Public Water Supplies." Journal of the American Water Works Association, 27(2):235-47.

Clemmer, H.F. 1923. "Field Experiments in Earth Road Oiling in Illinois." Municipal and County Engineering, 64(March):100-01.

Coates, V., T. Fabian, and M. McDonald. 1982. Nineteenth Century Technology -- Twentieth Century Problems: A Retrospective Mini-Assessment. For the U.S. Environmental Protection Agency, EPA-600/9/82-011. (NTIS, PB82-242058).

Corcoran, L.M. 1955. "Treatment of Anodizing Wastes by Ion Exchange." Sewage and Industrial Wastes, 27(November):1259-61.

Collier, H.W. 1941. Outlines of Industrial Medical Practice. Baltimore: Williams and Wilkins.

Colten, C.E. 1990a. "Historical Hazards: The Geography of Relict Industrial Wastes." Professional Geographer, 42(May):143-56.

_____. 1990b. "Environmental Development in the East St. Louis Region, 1890-1970." Environmental Review, 14:forthcoming.

_____. 1988. "Historical Questions in Hazardous Waste Management." The Public Historian, 10(Winter):7-20.

_____. 1986. "Industrial Wastes in Southeast Chicago: Production and Disposal, 1870-1970." Environmental Review, 10:93-106.

_____. 1985. Industrial Wastes in the Calumet Area, 1869-1970: An Historical Geography. Illinois Department of Energy and Natural Resources, Hazardous Waste Research and Information Center, Research Report 001. Savoy, IL.

Colten, C.E., and G.E. Breen. 1986. Historical Industrial Waste Disposal Practices in Winnebago County, Illinois, 1870-1980. Illinois Department of Energy and Natural Resources, Hazardous Waste Research and Information Center, Research Report 011. Savoy, IL.

Colten, C.E., and T.B. Samsel. 1988. Historical Assessment of Hazardous Waste Management in Madison and St. Clair Counties, Illinois, 1890-1980. Illinois Department of Energy and Natural Resources, Hazardous Waste Research and Information Center, Research Report 030. Savoy, IL.

Connecticut Department of Environmental Protection. 1989. Transfer Act Site Assessment Guidance Document. Hartford, CT.

Connolly, J.J., P.J. Croteau, and K.M. Burger. 1989. "The Necessity of and Methods for Conducting Environmental Site Assessment of Real Estate Prior to Purchase." The Environmental Professional, 11(1):1-7.

deChazeau, M.G., and A.E. Kahn. 1959. Integration and Competition in the Petroleum Industry, Petroleum Monograph Series, Vol. 3. New Haven, CT: Yale University Press.

Eldridge, E.F. 1942. Industrial Waste Treatment Practice. New York: McGraw-Hill.

Farer, D.B. 1989. "States and Transfer-Based Laws." Hazmat World 2(March):40.

Federal National Mortage Association. 1988. Environmental Hazards Management Procedures. Washington, DC: Federal National Mortage Association.

Feldman, L. 1985. "The Role of Environmental Site Assessments in Reducing Lender Risk in Massachusetts." Environmental Progress, 4(3):178-81.

Fulton, G.P. 1951. Applied Science for Drycleaners. Silver Spring, MD: National Institute of Cleaning and Dyeing.

Glass, E.A. 1987. "The Modern Snake in the Grass: An Examination of Real Estate and Commercial Liability Under Superfund and SARA and Suggested Guidelines for the Practitioner." Boston College of Environmental Affairs Law Review, 14:381-446.

Goldman, A. 1984. "Controlling PCBs." In Perilous Progress. Edited by R.W. Kates, C. Hohenesmer, and J.X. Kasperson, 345-70. Boulder, CO: Westview.

Goss, F.D. 1989. Environmental Evaluations for Real Estate Transactions: A Technical and Business Guide. Rockville, MD: Government Institutes, Inc.

Graham, A.K., ed. 1955. Electroplating Engineering Handbook. New York: Reinhold.

Greenberg, M.R., and R.F. Anderson. 1984. Hazardous Waste Sites: The Credibility Gap. New Brunswick, NJ: Center for Urban Policy Research.

Halbert, W.K. 1928. "Laying Dust on Roadbeds is New Market for Heavy Fuel Oils." National Petroleum News, 20(August):23-24.

Hamilton, A. 1925. Industrial Poisons in the United States. New York: McMillan.

_____. 1923. "Industrial Toxicology." In Legal Medicine and Toxicology. Edited by F. Paterson, 772-801. Philadelphia: Saunders.

Hayman, R. 1989. "HOTs: Underground Heating Oil Tanks Hold as Many Liabilities as Other USTs." Hazmat World, 2(3):54-56.

Hernandez, T.J. 1977. "Weed Control on Railways." Railway Engineer, 2(2):44-45.

Herndon, R.C. 1983. "Hazardous Waste Management: Land Use Implications for Non-Metropolitan America." In Beyond the Urban Fringe: Land Use Issues of Nonmetropolitan America. Edited by R.H. Platt and G. Macinko, 357-66. Minneapolis, MN: University of Minnesota Press.

Hill, J.B. 1939. "Waste Problems in the Petroleum Industry." Industrial and Engineering Chemistry, 31:1361-63.

Hodge, W.W. 1939. "Waste Problems of the Iron and Steel Industry." Industrial and Engineering Chemistry, 31:1364-80.

Hogarty, T.F. 1981. The Origin and Evolution of Gasoline Marketing. American Petroleum Institute Research Study #022. Washington, DC: American Petroleum Institute.

Hoover, C.R., and J.W. Masselli. 1941. "Disposal of Waste Liquors from Chromium Plating." Industrial and Chemical Engineering, 33(January):131-34.

Hornshaw, T. 1990. Personal Communication. Illinois Environmental Protection Agency, Office of Chemical Safety, Toxicity Assessment Unit (19 July).

Hoskins, J.K. 1927. A Study of the Pollution and Natural Purification of the Illinois River. U.S. Public Health Service Bulletin 171. Washington, DC.

Hughey, R.E., and A.J. McMahon. 1985. "New Jersey: A New Tactic Against Hazardous Wastes." EPA Journal, 11(3):16-17.

Illinois Custom Spray Operators Training School. 1949-1964. Summary of Presentations and Agriclutural Pesticide Dealers and Applicators Handbook. Cooperative Extension Service, College of Agriculture. Urbana, IL.

Illinois Department of Public Safety, Division of Fire Prevention. 1948. Gasoline and Volatile Oils. Springfield, IL.

Illinois Department of Trade and Commerce, Division of Fire Prevention. 1919. Gasoline and Volatile Oils. Springfield, IL.

Illinois Environmental Regulatory Group. 1988. Policy Guidance Document: Responsible Property Transfer. Springfield, IL: Illinois State Chamber of Commerce.

Illinois Highway Commission. 1911. Third Report of the Highway Commission, 1908-1909. Springfield, IL.

Illinois Rivers and Lakes Commission. 1913-1916. Annual Reports. Chicago, IL.

Illinois State Fire Marshal. 1916. Fifth Annual Report. Springfield, IL.

Illinois State Planning Commission. 1939. Report on the Upper Illinois River Basin. Chicago, IL.

Ingle, M. 1982. "Industrial Site-Building Implications from the 1978-79 Investigations at the Rogers Locomotive Works, Paterson, New Jersey. In Archaeology of Urban America. Edited by R.S. Dicken, 237-56. New York: Academic Press.

Italiano, M.L. 1987. Liability for Underground Storage Tanks. New York: Practicing Law Institute.

Johnston, D.A., and D.E. Jardine. 1989. Investigation into Methods and Costs for Disposal of Removed Underground Petroleum Storage Tanks and Associated Contents. Charlottetown, Prince Edward Island, Canada: P.E.I. Department of Environment.

Kingsbury, G.L., and R.M. Ray. 1986. Reclamation and Redevelopment of Contaminated Land, Vol. I, U.S. Case Studies. U.S. Environmental Protection Agency, Office of Research and Development, Hazardous Waste Engineering Research Laboratory. EPA/600/2-86/066. Cincinnati, OH.

Kober, G.M., and E.R. Hayhurst. 1924. Industrial Health. Philadelphia: Blakiston's and Sons.

Knox, C.E. 1988. "What's Going on Down There?: Pervasive Groundwater Contamination Prompts New Cleanup Approaches." Science News, 134(23):362-65.

Lamb, R.F. 1985. "Morphology and Vitality of Business Districts in Upstate New York Villages." Professional Geographer, 37(2):162-73.

Leal, J.L. 1901. "Legal Aspects of Water Pollution." Public Health, 27:103-13.

Leighton-Smith, S. 1987. "Issues in Lending . . . The New Innocent Party Defense Under SARA." The Journal of Commerical Bank Lending, 69(July):20-25.

Leitch, R.D. 1925. Stream Pollution by Wastes from By-Product Coke Ovens. U.S. Public Health Service. Washington, DC.

Lieb, C.H. 1985. Main Street to Miracle Mile: American Roadside Architecture. Boston: Little, Brown and Company.

Long, T. 1987. "Groundwater Contamination in the Vicinity of Agricultural Mixing and Loading Facilities." In Proceedings of the 16th Annual ENR Conference; November 12-13, 1987; Chicago, IL; 133-50.

McCord, C. 1931. Industrial Hygiene for Engineers. New York: Harper and Brothers.

Manufacturing Chemists' Association. 1955. Water Pollution Abatement Manual: Oils and Tars. Washington, DC: Manufacturing Chemists' Association.

_____. 1949. Water Pollution Abatement Manual: Insoluble and Undissolved Substances. Washington, DC: Manufacturing Chemists' Association.

_____. 1948. Organization and Method for Investigating Wastes. Washington, DC: Manufacturing Chemists' Association.

Martin, A.R. and G.P. Fulton. 1958. Drycleaning: Technology and Theory. New York: Textile Book Publishers.

Matis, J.R. 1971. "Petroleum Contamination of Ground Water in Maryland." In Proceedings of the National Ground Water Quality Symposium; August 25-27, 1971; Denver, CO., 57-61.

Mauch, J.C. 1990. "Site Assessment Standards Sorely Needed." Hazmat World, 3(3):36-39.

_____. 1989. "A Proposed Solution to the Uncertainty Surrounding the Innocent Landowner Defense." Toxic Law Reporter, 4(25):744-49.

Mehnert, E., and D.A. Keefer. 1988. Statewide Inventory of Land-Based Disposal Sites: An Update. Illinois Department of Energy and Natural Resources, Hazardous Waste Research and Information Center, Research Report 020. Savoy, IL.

Melosi, M.V. 1988. "Hazardous Waste and Environmental Liability: An Historical Perspective." Houston Law Review, 25(4):741-79.

_____. 1981. Garbage in the Cities: Refuse, Reform, and the Environment, 1880-1980. College Station, TX: Texas A & M University Press.

Miller, G.R., and N.B. Burch. 1981. "Impact of Municipal Treatment Plants on Toxic Pollutants in Wastewater." Environmental Professional, 3:79-84.

Miller, K.L. 1984. "Petroleum and Profits in the Prairie State, 1889-1980: Straws in the Cider Barrel." Illinois Historical Journal, 77:163-76.

Moskowitz, J.S. 1989. Environmental Liability and Real Property Transactions: Law and Practice. New York: Wiley.

Mulville-Friel, D. 1990. "Location of Underground Petroleum Storage Tanks in Macomb, Illinois, 1910-1990: An Historical Geography." Unpublished master's thesis, Western Illinois University, Department of Geography.

National Fire Protection Association. 1951. Recommended Procedures for the Abandonment or Removal of Underground Tanks. NFPA No. 30L. Boston: National Fire Protection Association.

_____. 1941. Leakage From Underground Storage Tanks. NFPA No. 30B. Boston: National Fire Protection Association.

_____. 1913. Suggested Ordinance Regulating the Use, Handling, Storage and Sale of Inflammable Liquids. NFPA No. 30L. Boston: National Fire Protection Association.

National Petroleum News. 1928. "Oil Marketing Trends to More Stable Conditions, Survey Finds." National Petroleum News, 20(April 18):29-30.

National Resources Committee. 1939. Water Pollution in the United States. H. Doc. 155, 76th Cong., 1st Sess. Washington, DC.

New Jersey Department of Environmental Protection. 1989. Guide to the Environmental Cleanup Responsibility Act and General Information Submission Form. Trenton, NJ.

New York Department of Environmental Conservation. 1985. Community Right to Know: Vol. II, Past Hazardous Waste Disposal Practices. Albany, NY.

Norris, D.A. 1987. "Interstate Highway Exit Morphology: Non-Metropolitan Exit Commerce on I-75." The Professional Geographer, 39(1):23-32.

Olian, R.M., ed. 1989. Illinois Environmental Law Handbook. Rockville, MD: Government Institutes.

Payne, J.L. 1989. "A Practical Approach to Environmental Audits." The Practical Real Estate Lawyer, 5(5):83-93.

Piskin, R., L. Kissinger, M. Ford, S. Colantino, and T.L. Williams. 1980. Inventory and Assessment of Surface Impoundments in Illinois. Illinois Environmental Protection Agency. Springfield, IL.

Pratt, J.A. 1980. "Letting the Grandchildren Do It: Environmental Planning During the Ascent of Oil as a Major Energy Source." Public Historian, 2(4):28-61.

Pred, A.R. 1964. "The Intrametropolitan Location of American Manufacturing." Annals of the Association of American Geographers, 54:165-80.

Price, G.M. 1914. The Modern Factory. New York: Wiley.

Randall, C.B. 1937. The Drycleaning Department. Silver Spring, MD: National Association of Dyers and Cleaners.

Reed, J.H. 1924. "Oiled Earth Roads in Illinois." Municipal and County Engineering, 66(March):141-43.

Robinson, J.E., D.W. Scott, W. Knocke, and W.D. Conn. 1988. Underground Storage Tank Disposal: Alternatives, Economics, and Environmental Costs. Virginia Water Resources Research Center, Virginia Polytechnic Institute and State University, Bulletin No. 160. Blacksburg, VA.

Ross, R.D. 1968. Industrial Waste Disposal. New York: Reinhold.

Rudolfs, W., ed. 1953. Industrial Wastes: Their Disposal and Treatment. New York: Reinhold.

Sapan, W. 1985. "Landfilling at the Telco Block: Social, Historical and Archeological Perspectives." American Archaeology, 5:170-74.

Schmidt, L., and C.J. Wilhelm. 1938. Disposal of Petroleum Wastes on Oil-Producing Properties. U.S. Department of the Interior, Bureau of Mines, R.I. 3394. Washington, DC.

Schock, S.C., M.M. Peyton, and E.P. Mills. 1988. Enhancement of HWRIC Database: Year 2 with Evaluation of Database Content. Illinois Department of Energy and Natural Resources, Hazardous Waste Research and Information Center, Research Report 024. Savoy, IL.

Shelby Loan v. White Star Refining Company. 1933. Illinois Appeals, 271:266-269.

Shumate, J.D. 1987. "Environmental Law: An Emerging Threat to Financial Institutions." Bank Administration, 63(February):44-46.

Smedley, P. 1989. "Why Scarce Loans For UST Upgrades Frustrate Marketers." National Petroleum News, 81(12):47-50.

Spitz, P.H. 1988. Petrochemicals: The Rise of an Industry. New York: Wiley.

Stilgoe, J.R. 1983. Metropolitan Corridor. New Haven, CT: Yale University Press.

Stirling, D.A. 1990. "Site Histories in Environmental Site Assessments." Public Historian, 12:45-52.

Tarr, J.A. 1985a. "Historical Perspectives on Hazardous Wastes in the United States." Waste Management and Research, 3:95-102.

_____. 1985b. "Industrial Wastes and Public Health: Some Historical Notes, Part I, 1876-1932." American Journal of Public Health, 75:1059-67.

_____. 1984. "The Search for the Ultimate Sink: Urban Air, Land, and Water Pollution in Historical Perspective." Records of the Columbia Historical Society, 51:1-29.

Tarr, J.A., J. McCurley, F.C. McMichael, and T. Yosie. 1984. "Water and Wastes: A Retrospective Assessment of Wastewater Technology in the United States." Technololgy and Culture, 25:226-63.

Taylor, G.R. 1915. Satellite Cities: A Study of Industrial Suburbs. New York: Appleton and Co.

Tejada, S. 1984. "Invisible Threat, Invisible Resource: Underground Tanks Contaminate Groundwater." EPA Journal, 10(1):20-22.

Teleky, L. 1948. History of Factory and Mine Hygiene. New York: Columbia University Press.

Trescott, M.M. 1981. The Rise of the American Electrochemical Industry, 1880-1910. Westport, CT: Greenwood.

Turkeltaub, R.B., and C.D. Wiehl. 1989. "Cleaning up Explosives Contamination at Army Munitions Plants Using Incineration." Hazmat Control, 2(4):26-34.

U.S. Environmental Protection Agency. 1984. Hazardous Waste Sites. HW 8.5. Washington, DC.

U.S. Environmental Protection Agency, Office of Public Affairs. 1988. "EPA Sets Standards for Underground Storage Tanks." EPA Environmental News. (Tuesday, September 13):2.

U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. 1987a. Underground Storage Tank Corrective Action Technologies. EPA 625/6-87-015. Washington, DC.

U.S. Environmental Protection Agency, Office of Underground Storage Tanks. 1987b. Cause of Release From Underground Storage Tank Systems: Final Report. Washington, DC.

U.S. General Accounting Office. 1987. Superfund: Extent of Nation's Potential Hazardous Waste Problem Still Unknown. GAO/RCED-88-44. Washington, DC.

U.S. Senate, Committee on Environment and Public Works. 1987. Disposal of PCB Contaminated Liquids by the Texas Eastern Gas Pipeline Company. Hearing Before the Subcommittee on Superfund and Environmental Oversight. S. Hrg. 100-53, 100th Cong., 1st Sess., March 17. Washington, DC.

University of Illinois. 1903. Agricultural Experiment Station Bulletin, 1901-1903. Champaign, IL.

_____. 1901. Agricultural Experiment Station Bulletin, 1896-1900. Champaign, IL.

Vieyra, D.I. 1979. An Architectural History of America's Gas Stations. New York: Macmillan Publishing Co.

Wahl, W.H. 1883. A Practical Guide for the Gold and Silver Electroplater. Philadelphia: Henry Carey Baird.

Waldstein, S. 1988. "A Toxic Nightmare on Elm Street: Negligence and the Real Estate Broker's Duty in Selling Previously Contaminated Residential Property." Boston College of Environmental Affairs Law Review, 15(Spring):547-591.

Warren, K. 1973. The American Steel Industry, 1850-1970. Oxford, England: Claredon Press.

Washington Department of Ecology. 1987. Site Discovery Project: Statewide Workplan. Prepared by HDR Infrastructure. Olympia, WA.

White, A.L. 1984. "The Site History: A Tool for Risk Management." Hazardous Waste, 1(4):533-43.

Williamson, H.F., R.L. Andreano, A.R. Daum, and G.C. Klose. 1963. The American Petroleum Industry: Vol. II, The Age of Energy, 1899-1959. Evanston, IL: Northwestern University Press.

Winder, R.R. 1986. "The Physical Renewal of the Industrial City." Annals of the American Academy of Political and Social Sciences, 488:47-57.

Appendix A

HAZARDOUS MATERIAL SITE HISTORY RECORDS

Appendix A. HAZARDOUS MATERIAL SITE HISTORY RECORDS

A.1 Level One Review

Records in this group provide statewide information and generally undergo a periodic updating. They can be reviewed for large or small areas and thereby offer some consistency across the state. Many of these records and historical documents can be obtained from different state and local agencies. Phone numbers and contacts for selected state agencies are listed throughout the three review levels.

A.1.1 Chain of Title

Some of the most consistent records available are the title and deed. Each time a piece of property changes hands, the buyer and seller are listed in an index in the county recorders office. A legal title search is usually completed before a land transaction takes place to ensure free and clear ownership for the prospective buyer. A title search offers useful information by containing descriptive records of the property and the names of previous owners (e.g., Power Chemical Company) that may have handled hazardous materials on site. However, ownership names do not always convey such telling information, and more research would need to be done to find out about the previous owners' activities.

A.1.2 Fire Insurance Maps

In the 1880s the Sanborn Map Company opened a branch office in Chicago and began preparing detailed fire insurance atlases of cities with populations over 2,000. The maps are color coded and show detailed floor plans of all buildings from outhouses to opera halls at a scale of 1 inch = 50 feet. Relevant information on potential hazardous material accumulations can be gleaned from these maps: company names and description of activities within industrial parcels (e.g., pits and lagoons, chemical storage areas, and underground gasoline tanks) are included along with geographical characteristics such as shorelines, streams, canals, railroad lines, and streets. Sanborn maps are limited in that they are not available for rural areas and only show detailed information for developed sections of urban areas. Most atlases date back to the late nineteenth century or the early twentieth century. Map updates were accomplished either by actually pasting the new land use over the previous land use, or by completely re-surveying and drafting a new base. By the late 1950s, fire insurance companies and underwriters no longer created a market for the maps, and most communities ceased to have them updated. Local libraries, historical societies, and city tax assessment offices sometimes retain updated versions of Sanborn atlases pertinent to their jurisdiction. The Illinois State Library has an extensive collection of Sanborn maps on microfilm and makes reels available to local libraries via interlibrary loan. The University of Illinois Map and Geography Library has the most complete set of hard copy Sanborn maps in the state; however, these do not circulate and must be used at the library in Champaign-Urbana. The Library of Congress in Washington, D.C., retains copies of over 90 percent of all Sanborn maps ever produced. Sanborn was the largest publisher of this type of map, although other companies produced similar atlases.

Illinois State Library
300 South 7th Street
Springfield, IL 62703

Reference Department, (217) 782-2995

Chadwyck-Healey Inc., microfilmed the Library of Congress' entire Sanborn map collection, and the Illinois State Library has purchased the microfilmed atlases for the State of Illinois (1884-1950). The maps are arranged on microfilm in the order they appear in the 1981 printed checklist of the Fire Insurance Maps in the Library of Congress.

University of Illinois
Map and Geography Library
418 University Library
Urbana, IL 61801

Map Librarian, (217) 333-0827

An extensive collection of original (hard copy) Sanborn Fire Insurance atlases for various cities and towns in Illinois. Material must be used at the library.

A.1.3 Topographic Maps

Under the supervision of the U.S. Geological Survey (USGS), detailed contour maps have been available since the early twentieth century. Most of Illinois was mapped by 1920 at a scale of 1:62,500 (15 minute quadrangles), and subsequent maps have been prepared at a scale of 1:24,000 (7.5 minute quadrangles). These maps provide a wealth of information on both rural and urban areas. Topographic maps provide information on natural (e.g., vegetation, landforms, waterways) as well as man-made features such as roads, buildings, utility and railroad right-of-ways, pits, lagoons, and sewage treatment facilities. In addition, successive topographic maps can be used to detect vegetation and surface alterations. Recent editions are available for purchase at the Illinois State Geological Survey and various commercial outlets across the state. The State Library, the University of Illinois Map and Geography Library, and the Illinois State Geological Survey have collections of current and historical topographic maps as do other local and university libraries.

Illinois State Geological Survey (ISGS)
Natural Resources Building
615 East Peabody Drive
Champaign, IL 61820

Ed Scoggin, (217) 244-0933

The ISGS sells copies of quadrangles in print for $2.50 per map sheet.

A.1.4 Aerial Photography

Aerial photography coverages of the state have been compiled by the Agricultural Stabilization and Conservation Service (ASCS) since the 1950s and by the USGS since the late 1930s. Most of these photographs were taken at a scale of 1:20,000. State agencies, such as the Illinois Department of Transportation and the Illinois Department of Mines and Minerals, and commercial aerial survey firms have flown special air photo missions during the last several decades. Historical aerial images can be useful for identifying past land-use activities and hazardous material locations. Depending upon the season photos were taken, health of vegetation, or lack of it, can be indicative of chemical leaks or spills. Alteration of geologic and topographic formations such as gravel pits, intermitant stream beds, and low-lying wetlands are easy to detect on aerial photographs. These formations were commonly used as dumping grounds, and in many cases they influence the directional movement of contaminants and susceptibility of aquifers. The University of Illinois Map and Geography Library has an excellent collection of ASCS and USGS aerial photographs for most areas of the state dating from the 1930s to present. Pre-1940 photographs must be used at the library; more recent photographs may be borrowed via interlibrary loan. Local Soil Conservation Service (SCS) offices, of which there are 96 throughout the state, house ASCS aerial photographs for their jurisdiction. These photos can be viewed at SCS regional offices. The Illinois State Geological Survey provides information on the availability of air photos and how they can be ordered from different federal agencies. The National Cartographic Information Center (NCIC) in Reston, Virginia, maintains old negatives of USGS coverages and can produce prints upon request. The NCIC may also provide information on commercial surveying firms that have flow photo missions for different parts of the country. In addition, most county and city assessors and planning offices have recent and sometimes special aerial photo collections.

Illinois Department of Transportation (IDOT)
2300 South Dirksen Parkway
Springfield, IL 62764

Bureau of Location and Environment, Don Rich, (217) 782-7627

IDOT has flown special air photo missions for highway corridor strips since 1956. Aerial photographs are indexed by location and are available for viewing at the Springfield office. Regional IDOT offices may also have historical imagery.

Illinois Department of Mines and Minerals (IDMM)
300 West Jefferson, Suite 300
Springfield, IL 62791

Land Reclamation Division, Ernie Ashby, (217) 782-4970

Aerial photographs of mining operations have been taken since 1962. These photos may be viewed at the Springfield office. Although they are not currently indexed by location or facility, each photograph has the mining operation, company name, and date printed at the top.

Illinois State Geological Survey (Champaign)

Ed Scoggin, Aerial Photographs, (217) 244-0933

The State Geological Survey has several aerial survey indexes and can provide advice and information on the availability, years, and coverage of aerial photographs for the state.

National Cartographic Information Center (NCIC)
U.S. Department of the Interior, Geologic Survey
507 National Center
Reston, VA 22092

NCIC Headquarters, (703) 860-6045

The NCIC has the Aerial Photography Summary Record System; a descriptive data base that can be searched to obtain information about aerial surveys that have been done for specific geographic areas (e.g., whose photographic project it was, the weather conditions under which the photographs were taken, and who now holds the film).

A.1.5 Environmental Agencies

As a result of recent state and federal environmental regulations, the amount and quality of information on hazardous material accumulations and pollution incidents has increased over the past 14 years. New environmental agencies and departments have been formed to enforce these regulations; however, information and records on historical hazardous material accumulations and pollution-related incidents are extremely sketchy and, in most cases, non-existent. Relatively few agencies monitored these activities previously, and those that did often threw out their records after a number of years. Other agencies have been disbanded or incorporated into different departments and buildings, which has contributed to the disposal and misplacement of many older records. Even though the amount and quality of information on hazardous material accumulations have increased over the past several years, data still are fragmented and information retrieval is slow at best. In some cases, information is stored in both electronic and paper files. Some agencies have electronic data bases that can be used to locate specific paper or microfilm files; however, file contents are not summarized or indexed to facilitate efficient searches by non-agency individuals attempting to investigate the contamination potential of specific and adjacent land parcels.

The following list of agencies includes those that currently regulate, permit, and house information on recent hazardous material and pollution-related incidents. Some of these agencies also have historical records that may prove useful when conducting site histories (see Level 3). State and federal records are public documents, although access may be restricted when litigation is in process. In most cases, a written Freedom of Information (FOI) request is required to review or obtain copies of agency records. Depending upon the size of individual requests there may be associated "record duplication" fees for copies made from microfilm, computer printouts, and paper files.

Illinois Department of Energy and Natural Resources
Hazardous Waste Research and Information Center (HWRIC)
One East Hazelwood Drive
Champaign, IL 61820

Jennifer Hines, Electronic Data Bases, (requests by mail only)
Daniel Kraybill, Freedom of Information Officer, (217) 333-8947

Statewide electronic data bases contain information on facilities, disposal sites, and waste handlers. Requests for information must be mailed to the HWRIC. A Comprehensive Inventory of Special Waste Handlers contains 15,331 records on businesses, industries, and sites associated with hazardous and non-hazardous wastes. An Inventory of Land-Based Disposal Sites includes descriptive data fields for 3,430 historical and currently active disposal sites. The Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) includes approximately 1,163 abandoned or uncontrolled waste sites identified under the federal Superfund program. Also, some 5,000 sites are included in a 1978 Surface Impoundment Assessment inventory. In addition, HWRIC has an extensive library collection and research clearinghouse devoted to hazardous waste-related topics.

Illinois Environmental Protection Agency (IEPA)
2200 Churchill Road
P.O. Box 19276
Springfield, Illinois 62794-9276

Michael J. McCabe, Freedom of Information Coordinator, (217) 782-3637

Air Pollution Control Division
Betty Ascher, Records Officer, (217) 782-2113

Permits are required for processes that emit air pollution. All active facilities are inspected periodically, and violators are referred to the Enforcement Programs section. There are approximately 11,000 facility files arranged by owner and location on an electronic data base. Paper files

contain all permit applications, inspection memos, correspondance, and any enforcement procedures dealing with non-compliance or accidental releases to the air. Some records inherited from the Department of Health date back to the late 1960s; however, only active facility records are maintained. Inactive facility records are kept for two years, then sent to the State Archives where they are housed for an additional seven-year period.

Enforcement Programs
Freedom of Information Officer, (217) 782-5544

Case files for each division of the IEPA are maintained by this section. These files begin in 1970 and document activities undertaken in the following areas: enforcement, variance recommendations, permit reviews and denial appeals, operator certification revocation, landfill siting reviews, and administrative and public hearings. The Enforcement Programs keeps an up-to-date card file of all cases, copies of Pollution Control Board orders and opinions, enforcement filings, and court case summaries. Much of the material housed in this office may not be available for public inspection because of on-going litigation.

Land Pollution Control Division
Vickie Beard, Freedom of Information Officer, (217) 782-6760

Records on hazardous material handling facilities are organized by county, city, and facility. Thirty plus types of files are maintained by this division some of which include hydrological investigations near waste disposal facilities; inventory of waste handling facilities required to file under the Resource Conservation and Recovery Act (RCRA); and sites listed under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA or Superfund), State Remedial Action Priority List (SRAPL) sites, and Immediate Removal and Voluntary Cleanup sites. Recent records are contained in paper files; information prior to 1979, on microfilm (see Level 3 for historical records description). As of January 1990, copies of disclosure documents, filed under Illinois' Responsible Property Transfer Act (IRPTA), are sent to this division and entered into a computer data base.

Leaking Underground Storage Tank (LUST) Unit
Harry Chappel, LUST Section Manager, (217) 785-4728

LUST incidents have been reported to this office since 1987. The office has also inherited LUST incident records (1980 to 1987) from the IEPA's Office of Emergency Response. All reported incidents are entered into a data base; searches can be made by county, city, facility, and address. Depending upon current staff load, data base queries can sometimes be performed without a FOI request. As of September 1989, there were

1,400 reported LUST cases. The IEPA estimates that currently they are receiving LUST reports at the rate of six per day. Paper files on correspondence, remediation plans, and follow-up inspections are available for each incident; a FOI request must be submitted to the Land Pollution Control Division to access these detailed files.

Public Water Supply Division
Linda Ray, Administrative Operations, (217) 782-1020

Paper and microfilm files on community water supplies (CWS) are arranged by facility number. File contents include construction permits, engineering reports and well surveys, correspondence, violations and enforcement procedures, water main extensions, plant improvement, bacteriological and chemical sampling history, and State Water Survey reports. Under the Illinois Groundwater Protection Act of 1987, the Groundwater Section of this division conducts well site surveys for implementing community well head protection plans. These surveys include, among other things, an inventory of potential pollution sources and routes of contamination within a 1,000 feet radial area of the well. Over 400 communties have well site surveys completed. Copies of these reports are on file with local libraries and county and city offices where the survey was completed.

Water Pollution Control Division
Sharon Haney, Records Officer, (217) 782-2137

Records on water pollution including municipal treatment works and industrial facilities are filed here. Recent records are in paper files. Pre-1980 records on microfilm and microfiche include wastewater discharge permits, correspondence, inspection reports, citizen complaints, and dredge and fill permits granted by U.S. Army Corps of Engineers subject to IEPA approval. Records can be searched by county, municipality, and facility (municipal or industrial).

Illinois Office of the State Fire Marshal (OSFM)
Division of Petroleum and Chemical Safety
1035 Stevenson Drive
Springfield, IL 62703-4259

Betty Carlisle, Underground Storage Tanks Section, (217) 785-5878
Earl Heffley, Public Information Officer, (217) 785-1021

Current legislation requires owners of chemical or petroleum USTs to file a standard notification form with the State Fire Marshal if their tanks were operating sometime after 1974 and still remain in the ground. There are currently 60,000 tanks that have been registered with this

division since 1985. Paper files on registered UST locations include notification forms, correspondance, and permits for tank installations and removals. A FOI request must be filed to access information contained in these files. A computer printout of all registered tank sites can be purchased for $65.

Illinois Pollution Control Board (IPCB)
State of Illinois Center
100 West Randolph, Ste 11-500
Chicago, IL 60601

Sandra Wiley, Administrative Assistant, (312) 814-3623

Evidence presented at hearings before the IPCB are hosued in this office and usually include industries requesting variances (exemptions) from pollution control deadlines or standards. Case indexes and records date from 1970 to the present and are arranged on index cards by docket number. All associated case materials (e.g., hearing transcripts, public comments, legal opinions) are either in paper files or on microfiche. Search capabilities are very limited; researchers may have some success if they are looking for a specific company that would be listed as either the plaintiff or defendant. IPCB case summaries are to be available through a subscription-based, legal data base called LEXIS. The data base is expected to be on-line by June 1990.

Illinois Department of Nuclear Safety
1035 Outer Park Drive
Springfield, IL 62704

Freedom of Information Officer, (217) 785-9900

The Nuclear Safety Department was created in 1980 and became the licensing authority for facilities that store or handle radioactive materials and instruments. Facilities range from hospitals to private businesses and nuclear power plants. This department has also carried out remedial cleanup plans at isolated locations where radioactive materials have been uncovered. Records on licensed nuclear power facilities were inherited from the Federal Nuclear Regulatory Commission (NRC). These NRC records extend back to the early 1960s. (Note: radioactive materials are classified separately from hazardous materials; however, the liability and cost of cleaning up land contaminated by radioactive materials are even greater.)

U.S. Environmental Protection Agency (USEPA), Region 5
Freedom of Information Officer
230 South Dearborn
Chicago, IL 60604

Office of Public Affairs, (312) 353-2072

Under the CERCLA of 1980, the USEPA maintains files that include detailed records on past and present hazardous material disposal sites. The sites are also contained in a computerized data base known as CERCLIS. The system's weakness is that many older or defunct companies provide only partial or no information. A Freedom of Information (FOI) request is required to access files.

A.1.6 Business Directories

Starting in the mid-1800s, a number of publishing companies established a thriving business compiling annual city directories. These directories are similar to telephone books (produced in the late 1920s) in that they list all residents and businesses alphabetically by last name, and aggregate businesses by the products and services they provide. An additional benefit of directories is that they arrange residents and businesses by their street and address numbers. Efficient searches for various businesses (e.g., gasoline filling stations, dry cleaners) and industries, that historically have stored or produced hazardous materials, can be made with these documents. Similar to a property title search, the street and address section of directories can be used to trace length of facility operation and changes in land use or ownership at particular sites. Directories still are published and generally are available for most communities. These documents are reliable sources of historical information for businesses within city limits; although, care must be taken when interpreting address locations which can vary from year to year, or represent a company's office location and not the manufacturing plant. Most city libraries have collections for their community. Occassionally, regional archives or local historical societies will have directory collections as well.

In 1893 the Illinois Manufacturer's Association was formed. By 1920 they were publishing an annual statewide listing of all member organizations. Their membership was largely Chicago-area manufacturers but also included factories from around the state. The directories are arranged by municipality with companies listed alphabetically. Entries provide a description of the products and sometimes list the number of employees. Addresses are given, but, like city directories, these may be for office sites and not production facilities. There is no complete collection of these directories. The University of Illinois has some as does the State Library and the Illinois Manufacturers' Association.

A.1.7 Land Ownership Maps

From the mid-1800s to present, there have been a variety of maps which identify land owners and detail property boundaries. County atlases, the earliest versions of these maps, originated between 1850 and 1880. These atlases provide detailed and, in some cases, the only information for rural areas. Drawings of factory exteriors commonly were included in early county atlases.

Plat maps succeeded county atlases. They began to be produced during the first third of this century. These maps are more utilitarian, but continue to show property lines and land ownership. Sometimes they even include types and names of factories, and descriptive land-use information such as city dumps. Plat maps are updated periodically and provide information for rural areas only. Hixon of Rockford was one major publisher, and more recently the Rockford Map Company has become the chief producer of this type of map. Most local and university libraries have whatever editions are available for their area as may local historical societies. The State Library and the University of Illinois Map and Geography Library have extensive collections of early county atlases and some more recent plat maps for many areas of Illinois. The Library of Congress in Washington, D.C. has a collection of early county atlases and original survey maps.

A.1.8 Census Records

The U.S. Census Bureau, in addition to making decennial population counts, takes an inventory of U.S. manufacturing activities at regular five-year intervals. While detailed information about specific industries is not made public until after 74 years, the Census of Manufacturing can give a general impression of the types of industries operating in a given county or municipality since the mid-1800s. This information may be useful for conducting inventories of community-wide hazardous material accumulations. The published census records indicate the type of industry (in recent years they use Standard Industrial Classification Codes), the number of workers in each major industrial category, and other summarized economic data. The Census of Business and the Census of Wholesale Trade, published since the late 1920s, can also provide insight into the general type and number of businesses that operated in any county, and in communities with populations over 2,500. Of particular value are categories for gasoline service stations and other automobile-related businesses. Local libraries have recent census reports; more complete sets are housed at various university libraries and at the State Library in Springfield.

A.2 Level Two Review

Records in this level may have been collected in a systematic fashion, but they do not afford statewide consistency; most are local in nature and require more extensive effort than the first level search. These records generally provide detailed information about particular sites. It must be remembered that many of the older records were not collected with hazardous materials in mind, although a creative researcher can use them to piece together an effective site history.

A.2.1 City and County Records

Specific records discussed here may or may not be accessible in a given community or county. Much depends on the size of the community, the evolution of agencies that handled records, and the familiarity of current workers with old records. Disposal, fire, and disappearance due to inattention are not uncommon fates for older documents.

A.2.1.1 Public Health Records

Most counties and/or communities have a public health office. Between about 1900 and 1970, they were responsible for keeping track of and approving waste disposal sites. They may have files on old garbage disposal facilities, complaints about nuisances caused by unauthorized dumping, and even surveys of historical disposal practices. In recent years, many health departments have been designated as local coordinators for responding to emergencies that involve hazardous material releases. For the same reason, these agencies may have inventoried chemical storage facilities including underground storage tanks, and locations where abandoned and active waste sites are located. Public health departments are also in charge of monitoring private well water supplies.

A.2.1.2 Public Works and Sanitation Agencies

During the early twentieth century, communities began to form public sanitation departments to collect and dispose of sewage and refuse. These agencies are often associated with community public works departments that have been entrusted with the design, construction, and maintenance of sewage and garbage disposal facilities. Both agencies may have files on old garbage dumps or treatment works, agreements with industries to use these facilities, and engineering reports and blueprints that address facility upgrades. In addition, meeting transcriptions and public minutes may record discussions and decisions made at meetings concerning these matters. Newspapers are also an excellent information source for capturing the essence of public meetings (see Level 3, A.3.4).

Metropolitan sanitary districts performed similar duties; although, they serviced several municipalities in highly industrialized urban areas. Illinois' first metropolitan sanitary district came into existence in 1889. These agencies may have old records

of specific industrial discharges to sewer systems or of efforts to keep industrial wastes from entering their systems. Most importantly, they should have surveys prepared when the initial treatment plant and subsequent improvements were built. These surveys, if done properly and maintained, will report on the contents and volume of specific industrial waste streams and the method of treatment/disposal used at the time.

A.2.1.3 Municipal Planning Departments

Planning agencies became common departments for larger municipalities during the 1920s and 1930s when many states passed planning- and zoning-enabling legislation. Planning departments prepare comprehensive plans that inventory community facilities and document improvements that are needed (plans are updated every ten to twenty years). Included in these comprehensive plans are land-use maps that show existing development of municipalities as well as desired future development and expansion. Zoning maps and ordinances, designed by these departments to control land-use activity and to separate incompatible land uses, may provide useful information on areas where industrial activity located in the past. Planning departments sometimes maintain historical records and maps used to compile these documents, and they may have records of industrial capacity surveys and information about past waste disposal and sewage treatment.

In addition to municipal planning departments, regional planning councils, formed during the mid-1960s, service different counties of the state. Regional council staff secured federal grants to perform studies for municipalities within their region. Some of these reports include industrial development surveys, solid waste plans, and sewage and water treatment facility upgrades.

A.2.1.4 Building and Assessment Offices

Since the mid-1920s, municipalities began to adopt building codes and standards designed by various professional building officers' organizations. Codes are designed to ensure that new development meets community health and safety standards. Normally, a town will not issue a building permit unless the property owner has complied with the building code and the zoning ordinance. Codes are enforced by building inspectors, and permits must be filed before demolition or construction activities begin. These permits sometimes contain information about previous land uses and present evidence that hazardous materials have been treated, stored, or disposed of on the property. There may be 20 or 30 permits for an address depending on subsequent development activities. Most municipalities file permits by property address or parcel number.

Municipal assessment offices have records on taxable land and facilities for individual parcels. Information for each parcel is maintained on what are referred to as "field cards." Depending on the quality of record keeping, these cards may contain valuable information on site plans, building types, and storage facilities.

A.2.1.5 Municipal Fire Departments

Municipalities began requiring operations that stored flammable materials to register these substances in the late nineteenth century. The earliest regulation and registration of flammable material storage facilities, including underground tanks, fell under the jurisdiction of the local fire marshal. The completeness of these records is highly variable and, after existing land uses changed, many documents were thrown out. Extant records may only deal with existing storage tanks.

Local fire departments also maintain fire report records that may reveal where hazardous materials have been stored in the past and where releases may have occurred. In addition, fires of great magnitude are likely to be recorded in State Fire Marshal Annual Reports (see Level 3, A.3.9.1). The local fire department is usually the first to respond to underground storage leaks that create explosive vapor concentrations in sewers, basements, and other man-made conduits. Local fire departments may also have current facility site plans for emergency response purposes under Community Right-to-Know laws.

A.2.2 State and Federal Agencies

Agencies listed for this level generally respond to emergencies and maintain files on reported hazardous material releases, and accidents. These agencies do not necessarily issue permits or regulate operations. Records have limited historical information.

Illinois Commerce Commission (ICC)
Transportation Division
P.O. Box 19280
527 East Capitol Avenue
Springfield, IL 62794-9280

Benard Morris, Chief Railroad Engineer, (217) 782-7660

Railroad reports to the Illinois Commerce Commission of accidents involving hazardous materials are generally kept for a three-year period. Not all reports filed by the railroads are public information. The Illinois Commerce Commission has begun to publish an annual calender year statistical report to the legislature on railroad accidents involving hazardous materials. The first report entitle 1989 Annual Report on Accidents Involving Hazardous Materials on Railroads in Illinois is available to the public as will be subsequent annual reports. The report contains such information as the date, general location, nature of incident, and the amount and type of material released.

Illinois Department of Labor (IDOL)
Toxic Substance Division
1 West Old State Capitol Plaza, Room 300
Springfield, IL 62701

Jerry Pusch, Safety & Education Manager, (217) 782-9386
Lenore Killam, Toxic Substance Division, (217) 782-4102

Facilities that handle, generate, or store certain types and quantities of hazardous substances must file Material Safety Data Sheets (MSDS). Since 1984, IDOL has been receiving MSDS submitted by public and private facilities under both the state and federal Worker Right-to-Know laws. An electronic data base contains summary information on facilities that have filed MSDS. Searches can be performed by company name and sometimes by zip-code area (searches by address fields are limited because of the original data base design). Submitted MSDS are copied onto microfilm and are available through a FOI request. IDOL also has some limited inspection records of facilities that had complaints brought against them because they did not file a MSDS, or provide local fire departments with facility layouts for emergency response.

Illinois Department of Law Enforcement
Division of State Police
201 East Adams, Suite 300
Springfield, IL 62701

Freedom of Information Office, (217) 782-5229

Records are kept on highway accidents involving hazardous materials. Files contain information on date, location, type and quantity of material released, and parties involved. These records are kept only for a three-year period.

Illinois Department of Mines and Minerals (IDMM)
Oil and Gas Division
300 West Jefferson, Suite 300
Springfield, IL 62791

Larry Bengal, Supervisor, (217) 782-6791 or 782-7756

The Oil and Gas Division responds to reported pipeline accidents and has records on such incidents from 1984 to present; however, no index of files currently exists. Information inquiries should include the pipeline company and location of investigation.

Illinois Emergency Services and Disaster Agency (IESDA)
Hazardous Materials Section
110 East Adams
Springfield, IL 62706

Oran Robinson, Supervisor, (217) 782-4694

Releases of hazardous materials and petroleum products have been reported to IESDA since 1987. All reported incidents are entered into a computer data base with the date, location, type and quantity of substance released, and facility involved. All incidents, depending upon their nature, are referred to different emergency response units. IESDA does not house detailed records and documents, but they would most likely be able to determine what agencies responded to a particular release.

Illinois Environmental Protection Agency
Office of Chemical Safety, Emergency Response Unit (ERU)
2200 Churchill Road
P.O. Box 19276
Springfield, IL 62794-9276

Cindy Wolfe, Records Officer, (217) 782-3637
Dennis Alhberg, ERU Manager

Records are kept on reported hazardous material or petroleum release incidents from 1972 to present. Approximately 16,000 incidents are recorded on a computer data base. Paper records contain detailed information about each incident. This office also maintains annual toxic chemical release reports and chemical storage information for certain types of private facilities under Section 313 of the federal Community Right-to-Know Act of 1986.

U.S. Army Corps of Engineers
U.S. Army Engineer Division, North Central
536 South Clark Street
Chicago, IL 60605-1592

Bob Warda, Division Manager, (312) 353-3679
Tim Kelleher, Inventory Project Report Preparation, (312) 886-0454

All active and former Department of Defense (DOD) sites have been inventoried and are slated for investigation under the Defense Environmental Restoration Program (DERP) established by Sec. 211 of the Superfund Amendments of 1986. Each site will eventually have an Inventory Project Report completed that identifies any potential environmental problems. Once the report is approved, remedial clean-up activities can begin. The Corps of Engineers North Central Division has all of the Formerly Used

Defense Sites (FUDS) for Illinois entered into a computer data base that can be searched by facility or location. Sites are in different stages of investigation, and certain files may not be open to the public.

U.S. Department of Transportation
Research and Special Programs Administration, Room 8406
400 Seventh Street, S.W.
Washington, D.C. 20590

Bea Vandervalk, Freedom of Information Officer, (202) 366-9638
Tom Fortner, Office of Pipeline Safety, (202) 366-4564

The U.S. Department of Transportation, Office of Pipeline Safety has received reports concerning hazardous liquid (including petroleum) pipeline incidents since the late 1960s. Each reported incidents is given a unique identification number and has a two page standard paper record on file that contains information such as date of incident, name of pipeline company, type and amount of substance spilled, general location (city, county, state), cause of incident, and resultant property damages, injuries or fatalities. Records are maintained on a computer data base to facilitate searches. As of June 1990, there were over 200 reported pipeline incidents that occurred in Illinois over the past 22 years.

A.3 Level Three Review

Records in this group require the most labor-intensive research, but they will yield the greatest detail for any selected site. There is no way to be certain that any of these sources will be available for a particular site.

A.3.1 Technical Publications

Manuals, guidebooks, and technical journals published from the late nineteenth century to the present provide some of the most detailed information about industrial activity anywhere. Major collections are found in the Crerar Library of the University of Chicago, and the University of Illinois Library. The manuals and guidebooks provided engineers with blueprints for setting up and maintaining industrial operations. Although these publications are general in nature, they provide insight into contemporary practices. More specific information can be found in the many journals and magazines published for the engineering community. Articles in these periodicals carried accounts of new technological developments that involved the use or treatment of hazardous materials and often highlighted specific factories using state-of-the-art technology at the time. Many articles of this type are referenced in the Industrial Arts Index (through 1957) and the Applied Science and Technology Index (after 1957).

A.3.2 Local Library

An often overlooked resource is the local public library. They will have some of the level one documents as well as special studies and reports, and sometimes archive records of local government agencies. Libraries collect published and unpublished information on area businesses and industries, photographs, and other documents that may be helpful for tracing the history of a particular piece of property. In addition, they usually have original or microfilm copies of town newspapers (occasionally these are indexed by subject). University libraries also specialize in local history.

A.3.3 Archival Records

State, local, and regional archival collections may contain useful, although limited, material for conducting site histories. They sometimes have old maps, photographs, town plans, narrative histories, and special archival research reports in their collections as well as industrial documents and company records donated by prominant local businesses (e.g., letters, contracts, reports, and product brochures). Archives generally have subject and collection indexes. There are seven regional archive depositories located at the following state universities: Eastern Illinois (Charleston), Illinois State (Normal), Northern Illinois (Dekalb), Sangamon State (Springfield), Southern Illinois (Carbondale), Western Illinois (Macomb), and Northeastern Illinois (Chicago). Also, there are over a thousand local museums and historical and genealogical societies across the state (a directory of these organizations can be obtained from the Congress of Illinois Historical Societies and Museums).

Congress of Illinois Historical Societies and Museums (CIHSM)
Old State Capitol
Springfield, IL 62701

Information Officer, (217) 782-4836

The 1989-1990 directory of Historical and Cultural Agencies and Museums in Illinois is available upon request. This directory has been placed in Illinois public libraries as well.

A.3.4 Newspaper Accounts

Newspapers report on fires, accidents, new factory construction and additions, court cases, public hearings, and other events linked to industries and waste accumulation. They are an extremely useful record, and if the dates of important events are known, searches can be narrowed for more detailed information. In some towns, the local historical society or library has compiled subject indexes which facilitate searches for specific information. Newspaper publishers or libraries may also have clipping files organized by subject. The Illinois State Historical Library has a collection of newspapers for most areas of the state on microfilm, and many libraries have microfilm copies of their local newspapers.

Illinois State Historical Library
Old State Capitol
Springfield, IL 62701

Newspapers, Laura Birk, (217) 785-7941

The State Historical Library maintains a listing of city newspapers housed in their collection; although, none are indexed by subject. The collection has excellent coverage for most cities and towns since the turn of the century. Individual microfilm reels are available through interlibrary loan (see Illinois Libraries, 1988, vol. 70(3-4).

A.3.5 Court Records

Litigation records are found at several different levels. Local/county court records are kept by the Clerk of Court. Circuit court (county level) clerks maintain an annual plaintiff-defendant index which can be searched by company name to identify possible nuisance or pollution cases heard at the local level. Cases that move up to the state appeals court are summarized in published reports, Illinois Appeals. Briefs (arguments filed on behalf of plaintiffs or defendants) may indicate specific industrial processes and even how wastes were handled. Evidence and transcripts are harder to come by, but will have even greater detail. Judges' rulings summarize evidence and offer legal opinion. Judgements at the local level may not be found in the clerk of court's records, but both appeals and state

supreme court judgements are published. The Illinois State Archives (Springfield) maintain paper records of most State Supreme Court cases. Sometimes regional archives maintain local and circuit court case material (see Archival Records A.3.3). Law firms involved in nuisance litigation may have detailed information no longer accessible through other sources.

Office of the Secretary of State
Illinois State Archives
Springfield, IL 62756

Charles Cali, (217) 782-3503

The State Archives keeps records of cases that have gone before the Illinois State Supreme Court. Case transcripts and other material accumulated from lower court trials often become part of supreme court case records. All material must be reviewed at the archives, and it is necessary to have reference information (e.g., case name, date, docket number) in order for archivists to locate specific Supreme Court case files. Most law libraries have a State Supreme Court case index which can be searched to obtain reference information for specific cases.

A.3.6 Interviews/Oral Histories

Interviews with local individuals provide valuable insight into past activities at a site. Historical societies, schools, and libraries are recording interviews with older citizens, and many now have collections for their communities. While these interviews often do not contain information about hazardous materials, they help identify individuals who are familiar with undocumented activities at industrial sites and old dump locations. Retired factory workers, real estate brokers, fire chiefs, and other municipal officials are excellent sources of historical information. In addition, the street and address section of city directories may prove useful for identifying potential interviewees such as, long-term residents who lived near a particular site or previous owners who remember past activities or events. In many cases, interviews with people other than the current property owner will yield more detailed and specific information about past land uses.

A.3.7 Company Records

Manufacturers' records most often include factory layouts, maps, letters, production figures, financial reports, historical photographs, annual reports, and unpublished histories. While these records may have the most accurate and detailed information, they are seldom accessible.

Consultants' records include reports and plans for industrial waste treatment, and equipment designed for manufacturers. Individual consulting companies often keep on file older engineering drawings and plans, and they are generally amenable to making copies available.

A.3.8 Brokerage Directories

Moody's Industrial is an annual publication that provides updated profiles of industrial firms that are listed on major stock exchanges. The descriptions focus on financial information, but they also include inventories of major holdings and production capabilities. Only larger companies will appear in these listings, and often all facilities and subsidiaries are lumped into a single corporate inventory. The Illinois State Library has a complete set of Moody directories, and most university libraries will have good holdings as well.

A.3.9 State Agency Historical Records and Resources

Agencies listed in this level have some historical records and resources that are useful for individuals conducting site histories. Some of these agencies were listed under previous review levels because they also maintain current records on hazardous materials and pollution incidents.

Illinois Department of Mines and Minerals (IDMM)
300 West Jefferson, Suite 300
Springfield, IL 62791

Land Reclamation Division, (217) 782-4970

This division has regulated surface coal mining operations since 1962. Files are maintained for individual mine sites and include permit information as well as reclamation operations and enforcement and inspection activities. Since 1968, a number of mine sites have been granted refuse disposal permits for land reclamation purposes.

Oil and Gas Division, (217) 782-7756
Larry Bengal, Supervisor, (217) 782-6791

Permits issued for oil and gas producing wells are kept on file. Records extend back to 1940s; however, file contents are sparse and usually contain only a copy of the permit and completion report.

Illinois Department of Transportation (IDOT)
2300 South Dirksen Parkway
Springfield, IL 62764

Division of Water Resources
Dave Boyce, Flood Plain Management Engineer, (217) 782-0690

Dating back to the early 1900s, construction permits were granted for sewage outlets, structures (e.g., bridges, buildings, levees), and fill along waterways. These permits were issued to ensure that stream flow would

not be obstructed by construction activity. Microfilm records include permits, name of applicant, correspondence, and follow-up inspections at the sites. The permit type and number are entered into an electronic data base along with general location coordinates to facilitate searches. Correspondance and inspection records may contain information on the types of material used to fill sites along waterways.

Illinois Environmental Protection Agency
2200 Churchill Road
P.O. Box 19276
Springfield, IL 62794-9276

Intra-agency Freedom of Information Coordinator
Michael J. McCabe, (217) 782-3637

Land Pollution Control Division
Vickie Beard, Freedom of Information Officer, (217) 782-6760

This division has some pre-1970 records on landfills and other land pollution incidents inherited from the State Public Health Department. These records are on microfilm arranged by facility and location. Coverage is good for 1960s to present, but poor before 1960. Regional IEPA offices also have "Closed and Covered" files on abandoned landfills.

Public Water Supply Division
Linda Ray, Administrative Operations, (217) 782-1020

Records date back to 1915 when this division was part of the State Department of Public Health. Paper and microfilm files are set up by facility number, which basically groups water supplies alphabetically within counties. File contents generally include construction permits, engineering reports and well surveys, correspondence, violations, sampling analysis, and State Water Survey reports.

Water Pollution Control Division
Sharon Haney, Records Officer, (217) 782-2137

Sanitary Water Board inspection records dating from 1929 to 1970 are filed in this office by facility and location. Revealing correspondence materials on water pollution incidents, including maps, table statistics, and some newspaper clippings, make up the majority of these historical microfiche records. There are some excellent records here, although coverage is uneven.

Illinois State Geological Survey (ISGS)
Natural Resources Building
615 East Peabody Drive
Champaign, IL 61820

Public Information, (217) 244-2413

The ISGS has compiled a geographic information systems (GIS) coverage that depicts all areas of the state subject to coal mining since the late 1800s. Studies and reports on oil and gas producing wells, and large scale (1:500,000) paper maps showing pipelines, oil and gas fields, and associated facilities have been compiled on a fairly regular basis since 1927. The ISGS has also produced a wealth of published (i.e., Environmental Geology Notes) and unpublished reports for different areas of the state. These reports often deal with geological and geophysical investigations of ground-water supply and susceptability for specific Illinois communities. A complete listing of publications is available upon request. Most of these reports are still in print and can be purchased, while others may be used at the ISGS library in Champaign. The library also maintains an excellent collection of current and historical topographic maps (see Level 1, A.1.3).

Illinois State Water Survey (ISWS)
2204 Griffith Drive
Champaign, IL 61820

Scott Meyer, Ground-Water Section Files, (217) 333-0162

This survey has some limited reports of investigations centered around well logs and well water supplies. Paper files include some of the earliest records (1910s) of pollution incidents and public response. Files are organized by counties, municipalities, and township/range coordinates. Their coverage is uneven; although, some contain blueprints showing details of factories, photographs, newspaper clippings, letters, and other miscellaneous materials.

Illinois State Historical Library
Old State Capitol Plaza
Springfield, IL 62701

Reference Library, (217) 785-7945

All materials are cataloged by title, author, and subject. There are myriad items housed in this library including photographs, maps, company brochures, and various local and county histories. A quick search under a specific company's name may turn up useful material.

Illinois State Library
300 South 7th Street
Springfield, IL 62703

Reference Department, (217) 782-2995

This library has an excellent collection of USGS topographic maps, ISGS active and inactive coal mining operation maps (1:100,000), ISGS oil and gas maps (1:500,000) with pipelines and associated facilities indicated, early county atlases, Sanborn Fire Insurance maps (on microfilm), Illinois Blue Books, and annual reports put out by various state agencies that date back to the late 1800s (see Level 3, A.3.9.1).

Illinois State Museum, Geography Program
Research and Collection Center
1920 South 10 1/2 Street
Springfield, IL 62703

Craig Colten, Associate Curator of Geography, (217) 524-7901

The Museum Geography Program has some limited historical records collected from various state agencies and archival sources for particular industrial districts of Illinois (i.e., Southeast Chicago, East St. Louis, and Rockford). Also some information on historical waste management practices and source materials are maintained.

A.3.9.1 Annual and Special State Reports

At the turn of the century, a number of state agencies began to publish summary reports of inspection activities undertaken by their different divisions. Departments concerned with either public health or water quality are likely to have descriptions of municipal and industrial sewage treatment activities, surface water quality, and other environmental concerns. Their annual and special reports often provide descriptive case studies of cities and settlements around the state. For instance, the State Water Survey Division published special bulletins and surveys of stream conditions and domestic and industrial pollution sources around the early 1900s. The Department of Public Works and Buildings, Division of Waterways began to publish annual reports in 1916 with sections discussing specific activities and locations around the state where submerged lands have been filled in with "debris" and waste products. Annual reports of the Chief State Factory Inspector highlight industrial hygiene practices and hazardous working conditions involving toxic chemicals as far back as 1893. The State Board of Health began publishing annual reports in 1878, and some of these included sanitary surveys of towns with descriptions of their water supplies, municipal sanitation activities (e.g., sewage and garbage), and local ordinances and activities associated with public health. The Rivers and Lakes Commission (1911-1916) reported on pollution cases brought before the commission members. Locating these reports is not an easy task.

University libraries usually have some of these in their state documents section, as does the State Library in Springfield; however, reports may be filed under either the major agency or the division name which often change over time as agencies restructure. Illinois Blue Books (annual state agency directories) may be helpful for tracking down the chronology and evolution of departments and their different divisions.

Appendix B

PROPERTY TRANSFER PROJECT QUESTIONS

Illinois State Museum
Property Transfer Project Questions
1/2/90

REAL ESTATE PURCHASERS

1. How would you characterize your familiarity with the CERCLA/SARA liabilities associated with ownership of contaminated property (--very familiar, slightly familiar, only know that there is some responsibility)? Are you familiar with the Illinois Responsible Property Transfer Act?
2. How did you become aware of these legal obligations?
3. Have you attended a workshop, seminar, or received instruction addressing these pieces of legislation? (when?) If yes, please indicate the sponsor/organizer and approximate date (year).
4. Does your company have a **policy** to deal with the discovery of unknown hazards on property you are developing (before purchase, after purchase, as broker--are there any specific steps outlined to deal with hazardous materials or do they continue, business as usual)? What is it?
5. Have you conducted or do you intend to conduct site histories on property you handle?
6. What types of property do you investigate? Those required by the Illinois Responsible Property Transfer Act? Additional types? Do you intend to change this in the future?
7. Do you conduct your own site histories or do you rely on consulting firms? (why?)
8. How do you go about selecting a company (environmental, legal, engineering)? What qualifications do you look for in the people doing the site history?
9. What do you expect in a site history? Do you have guidelines you follow, guidelines recommended by the lending institution, or by the consultant? Could we obtain a copy of any published guidelines?
10. In a typical phase one review (records search) what type of historical information would convince you that the site is free of environmental defects (Illinois Responsible Property Transfer Act term)? Would a twenty year review prove satisfactory, a thirty year review, a fourty year review?
11. What type of information would make you proceed with a phase two review? (how far back do you think it prudent to explore documentary sources)?
12. How do you feel about the costs associated with a site history? (reasonable, excessive, well worth the price if hazardous materials turned up) Who pays?
13. Have you or your business had any experiences with hazardous materials in the past? How did you handle it? Report it to authorities? Clean it up? Back out of the deal? (If so, did you notify authorities that the site was possibly contaminated?) Was this brought about by faulty or inadequate site history?
14. Do you have confidence that the Illinois Responsible Property Transfer Act will protect developers who serve as middle men in the redevelopment of old industrial sites? Why/Why not?
15. Do you feel the government should set standards that would establish what constitutes a clean site and a contaminated site? Why?

16. How would you react to a more stringent property transfer law (encompassing more types of transactions and requiring more thorough reporting and government approval)?
17. Do you feel it would benefit real estate developers if results were computerized for immediate access to the business community? Should notice of contaminated sites be released to the media?
18. Do you think this procedure would enable your firm to avoid acquiring contaminated property?

LENDERS

1. How would you characterize your familiarity with the CERCLA/SARA liabilities associated with ownership of contaminated property (--very familiar, slightly familiar, only know there is some responsiblity)? Are you familiar with the Illinois Responsible Property Transfer Act?
2. How did you become aware of these legal obligation?
3. Have you attended a workshop, seminar, or received instruction addressing these pieces of legislation? When? If yes, please indicate sponsor/organizer and approximate date (year).
4. Does your company have a **policy** to deal with the possible discovery of unknown hazards on property you are considering or have made a loan on (before or after purchase, or business as usual)? What is the policy?
5. Have you required or do you intend to require site histories (your term here) on property you make loans on or develop? If yes for past tense, why did you conduct them before the Illinois Responsible Property Transfer Act went into effect?
6. On what types of property do you require investigations? Those required by the Illinois Responsible Property Transfer Act? Additional types? Do you foresee making any changes in the future?
7. Is your institution losing business as customers go to lending institutions that do not require site histories? Are there still many lending institutions not requiring site histories?
8. Do you conduct your own site histories (if so, do you have staff who specialize in this type of work?) or do you rely on consulting firms? (why?)
9 . How do you go about selecting a company (engineering, environmental, legal)? What qualifications do you look for in the people doing the site history?
10. What do you expect in a site history? Do you have guidelines you follow, guidelines recommended by a trade organization or insurer or by the consultant?
11. Do you have a checklist of particular types of property that should have site histories (e.g. particular types of industrial activity)?
12. In a typical phase one review (records search) what type of historical information would convince you that the site is free of environmental defects (Illinois Responsible Property Transfer Act term)? Would a twenty year review prove satisfactory, a thirty year review, a fourty year review?
13. What type of information would make you proceed with a phase two review? (how far back do you think it is prudent to explore documentary sources?)

14. How do you feel about the costs associated with a site history? (reasonable, excessive, well worth the price if hazardous materials turned up) Who pays?
15. Have you or your business had any experiences with hazardous materials in the past? How did you handle it? Report it to authorities? Clean it up? Reject the loan? Foreclose on contaminated property? (If so, did you notify authorities that the site was possibly contaminated?) Was this situation brought about because of an inadequate or faulty site history?
16. Do you have confidence that the Illinois Responsible Property Transfer Act will protect developers who serve as middle men in the redevelopment of old industrial sites (and lenders who underwrite such projects?)?
17. Do you feel the government should set standards that would establish what constitutes a clean site and a contaminated site? Why?
18. How would you react to a more stringent property transfer law (encompassing more types of transactions and requiring more thorough reporting and government approval)?
19. Do you feel that it would facilitate property transfers if disclosure documents were computerized for access to site investigators? Should notice of contaminated property be released to the media?
20. Do you think the current system will help your institution avoid acquiring contaminated property?

CONSULTANTS

1. How would you characterize your familiarity with the CERCLA/SARA liabilities associated with ownership of contaminated property (--very familiar, slightly familiar, only know there is some responsibility)? Are you familiar with the Illinois Responsible Property Transfer Act?
2. How did you become aware of these legal obligations?
3. Have you attended a workshop, seminar, or received instruction addressing these pieces of legislation? If yes, please indicate sponsor/organizer and approximate date (year).
4. Do you think companies should have a **policy** to deal with the discovery of hazards on property (before purchase, after purchase, business as usual)? What would you recommend to clients?
5. Have you conducted site histories in the past? Do you foresee this being a big part of your business in the future?
6. Will you expect these investigations to be limited to the type sites that fall under the Illinois Responsible Property Transfer Act? (what additional types of property will you recommend clients seek information on?)
7. Do you conduct the full site history or do you hire outside specialists to conduct the historical section of a phase one audit?
8. How do you go about selecting staff/sub-contractors to perform the historical research? What type of background/qualifications do you look for?
9. What do you feel is an adequate site history? Do you have guidelines you follow, guidelines recommended by the lending institution, or some professional organization? Could you provide a copy?

10. In a typical phase one site review (records search) what type of historical information would convince you that the site is free of environmental defects (Illinois Responsible Property Transfer Act term)? Can you provide examples? Would a twenty year review prove satisfactory, a thirty year review, a fourty year review?
11. Have property owners been forthcoming with reliable information? Have government agencies been cooperative?
12. Do you follow a checklist of industries to identify sites of possible past contamination? What is the source of this checklist?
13. What type of information would make you proceed with a phase two audit? (how far back do you think it prudent to explore documentary sources)?
14. How do your clients feel about the costs associated with a site history? (reasonable, excessive, well worth the price if hazardous materials turned up)? Are you able to offer thorough investigations for the going rate? What would you be able to offer for $200-250? Would that be adequate? Any guarantees?
15. Have you or your business had any experiences with property contaminated with hazardous materials in the past? How did you handle it? Report it to authorities? Recommend clean up? (Did you notify authorities that the site was contaminated? Is this considered proper business in the consulting field?)
16. Do you know of examples where hazardous materials were discovered after a site history was completed to the satisfaction of the client? What was the outcome of this situation?
17. What type of protection do you have for your services (errors and ommissions insurance? disclaimer?)
18. Do you have confidence that the Illinois Responsible Property Transfer Act will protect innocent property buyers?
19. Do you feel the government should set standards that would establish what constitutes a clean site and a contaminated site? Why?
20. How would you react to a more stringent property transfer law (encompassing more types of transactions and requiring more thorough reporting and government approval)?
21. Do you feel that computer access to existing disclosure documents would aid you in site audits? Should notice of contaminated property be released to the media?
22. Do you feel the current system will make acquisition of contaminated property a more remote possibility and thereby protect property buyers?

Appendix C

PROPERTY TRANSFER PROJECT CONTACTS

ORGANIZATIONS AND INDIVIDUALS CONTACTED

Name	Organization
Melissa Valentin	Environ
Robert Stewart	HRP Associates
Tom Dong	SCS Engineers
Mark Zdepski	J. Mark Zdepski, Inc.
Richard Carlson	Carlson, Knight, and Kudrna
John Yoshintani	Camp Dresser McKee
Emma Kowalenko	Kowalenko and Associates
Kevin Greene	Illinois Environmental Council
John Washburn	Illinois Department of Transportation
Bob Bauer	Illinois State Geological Survey
Sid Marder	Illinois Chamber
Richard Kuntz	Wildman, Harrold, Allen & Dixon
L.L. Schneider	Met Inc.
Luther Landrum	Regulatory Compliance Associates
Donald Rundblom	Atkins Mortage Co.
Wayne Anderson	Coldwell Banker
Steve Hornung	Sverdrup Corp.
Donna Hall	Hunter Environmental Sciences
Nancy Piazza	Life Systems Inc
Russell Urban-Mead	Roy Budnik and Associates
Tracy Stapleford	Dunn Geosciences
Kathy Minders	Sargent, Hoskins, & Beckwith
David Culpepper	Groundwater Technology
Louis Fournier	Groundwater Technology
Cynthia Hall	Chicago Department of Economic Development
Roberta Deering	Upper Illinois Valley Association
Gary Hunt	North Carolina Department of Environmental Management
Bob Beretsky	New Jersey Department of Environmental Protection
Ken Bechely	Clayton Environmental Consultants
Jean Downer	SCS Engineers
Gerald Pearson	Speedstar
Steve Chapman	Gerherty & Miller
Quentin Davis	City of Peoria
Martha Beach	N-Con Systems
William Lemire	Environmental Control and Abatement
Jeffrey C. Howry	Leggat McCall
Jeffrey Young	HDR Infrastructure
Andrew Harvey	Engineering Strategies
Bernadette Patton	Illinois Bankers Association
Robert Walters	Southwest Illinois Industrial Association

Illinois Association of Environmental Professionals
Consulting Engineers Council of Illinois
Illinois Association of County Officials
Illinois Association of Mutual Insurance Companies
Illinois Bankers Association
Illinois Fertilizer & Chemical Association
Illinois Land Improvement Contractors
Illinois Manufacturer's Association
Illinois Petroleum Council
Illinois Petroleum Marketers Association
Illinois Public Airports Association
Illinois State Bar Association
Independent Community Banks in Illinois
Illinois Association of Realtors
Land Title Association
Illinois League of Savings Institutions
Illinois Railroad Association
Printing Industry of Illinois
Small Business Association Service Center
American Planning Association, Illinois Chapter
American Public Works Association
Bi-State Metropolitan Planning Commission
Chemical Industry Council
Chicago Association of Commerce and Industry
Illinois Association of Realtors
Northeastern Illinois Planning Commission

INTERVIEW SUBJECTS

Name	Affiliation	Date
Guerine Turano	Chicago Title Insurance Co.	2/9
Bruno Tabis	Anderson, McDonnell, Miller, and Tabis	1/29
Mike Rapps, Susan Denham	Rapps Engineering and Applied Science	1/10
Tom Hahn	CorLands	2/9
Art Seppi	Charles E. Robbins Realtor	2/13
Ron Sides	Marine Bank of Springfield	2/16
Terry Schad	Illinois National Bank of Springfield	2/14
Tim Smelling	John B. Clark	2/14
John Washburn	Illinois Department of Transportation	1/10
Thomas W. Daggett	Wildman, Harrold, Allen, and Dixon	2/14
Richard Carlson	Carlson, Knight and Kudrna	2/9
Thomas Reid	Illinois Manufacturers Association	2/8
Bill Lemire	Environmental Control and Abatement	1/31
Emma Kowalenko	Kowalenko & Associates	1/29
Donna Hall	Hunter Environmental Sciences	1/31
Bob Bauer	Illinois State Geological Survey	1/19
Cynthia Hall	City of Chicago	2/14
Quentin Davis	City of Peoria	2/7
Don Rundbloom	Atkins Group	1/19

MAIL QUESTIONNAIRE RESPONDENTS

Name	Affiliation
Nancy F. Piazza	ICAIR, Life Systems, Inc.
Mark Zdepski	J. Mark Zdepski, Inc.
Bruce G. Siminoff	Commerce and Industry Association of New Jersey

Appendix D

ILLINOIS RESPONSIBLE PROPERTY TRANSFER ACT

Law Review Commentaries

Responsible Property Transfer Act: A trap for the unwary Kay L Pick, 3 Chi B Rec 20 (1989)

WESTLAW Electronic Research

See WESTLAW Electronic Research Guide following the Preface

901. Short title

§ 1. Short title. This Act shall be known and may be cited as the Responsible Property Transfer Act of 1988.

P.A. 85–1228, § 1, eff. Nov. 1, 1989.

Historical and Statutory Notes

Section 8 of P A 85–1228, approved Aug. 30, 1988, provided:

"This Act shall take effect November 1, 1989 "

Title of Act:

An Act in relation to the transfer of real property P A 85–1228, approved Aug 30, 1988, eff. Nov. 1, 1989

902. Purpose

§ 2. Purpose The purpose of this Act is to ensure that parties involved in certain real estate transactions are made aware of the existing environmental liabilities associated with ownership of such properties, as well as the past use and environmental status of such properties. It is also the purpose of this Act to ensure that the interest of the People of the State is protected by providing a mechanism whereby parties to a real estate transaction are advised of the environmental condition of such property and thus are encouraged to act in a responsible manner so as to fulfill the purpose and intent of existing environmental laws.

P.A. 85–1228, § 2, eff. Nov. 1, 1989.

903. Definitions

§ 3. Definitions. As used in this Act:

(a) "Disclosure document" means a document containing the information prescribed in Section 5 of this Act [1] and used to communicate information between the parties to a real property transaction.

(b) "Facility" means all buildings, equipment, structures and other stationary items which are located on a single site.

(c) "Lender" means any financial institution, insurance company, corporation, partnership, person or other entity which advances funds secured by an interest in real property or collateral assignment of beneficial interest in an Illinois land trust holding title to real property.

(d) "Parties to the real property transfer" means, as applicable, the transferor, transferee and any lender.

(e) "Real property" means any specific and identifiable parcel of land, including improvements thereon, located within the State of Illinois which has not been subject to bonding or other financial assurances released by the appropriate governmental agency after compliance with applicable State environmental laws, and which:

(1) contains one or more facilities which are subject to reporting under Section 312 of the federal Emergency Planning and Community Right–to–Know Act of 1986,[2] and federal regulations promulgated thereunder; or

(2) has underground storage tanks which require notification under Section 9002 of the Solid Waste Disposal Act, as now or hereafter amended (42 U.S.C. 6991).

(f) "Specific and identifiable parcel of land" means a portion of real property containing facilities which may be identified by the address provided on reporting forms used to report under Section 312 of the federal Emergency Planning and Community Right–to–Know Act of 1986, and federal regulations promulgated thereunder, or by boundary lines which are provided on such property's applicable Illinois Environmental Protection Agency permit applications. If only a portion of a real property is transferred, then this Act shall only apply to such portion actually being transferred.

(g) "Transfer" means any conveyance of an interest in real property by:

(1) deed or other instrument of conveyance; or

(2) a lease of real property whose term, when considering all options which may be exercised, exceeds 40 years; or

(3) an assignment of more than 25% of the beneficial interest in an Illinois land trust; or

(4) a mortgage, trust deed, or collateral assignment of a beneficial interest in an Illinois land trust.

However, "transfer" does not include the following: deeds or trust documents or mortgages or trust deeds or collateral assignments of a beneficial interest in an Illinois land trust which, without additional consideration, confirm, correct, modify or supplement a document previously recorded; tax deeds; deeds or trust documents of release of property which is security for a debt or other obligation; deeds of partition; conveyances occurring as a result of a foreclosure of a mortgage, trust deed, or other lien on real property; a Uniform Commercial Code [3] sale or other foreclosure of a collateral assignment of a beneficial interest in an Illinois land trust; advances by a lender secured by a previously recorded mortgage, trust deed, or a collateral assignment of a beneficial interest in an Illinois land trust including, without limitation, such advances under line of credit loans and construction loans; modifications, supplements and amendments to existing mortgages, trust deeds, and collateral assignments of beneficial interests in Illinois land trusts which with or without additional consideration do not involve the advancement of additional funds by the lender; easements; and conveyances of an interest in minerals, oil or gas.

(h) "Transferee" means a buyer, trustee under a trust deed (except for purposes of Section 6),[4] mortgagee (except for purposes of Section 6), grantee or lessee of real property, or an assignee (except a collateral assignee for purposes of Section 6) of a greater than 25% interest in an Illinois land trust, or in the case of a transfer to the

trustee of an Illinois land trust, the owners of the beneficial interest of the land trust.

(i) "Transferor" means a seller, grantor, mortgagor under a mortgage or trust deed, or lessor of real property, an assignor of a greater than 25% interest, collateral or otherwise, in an Illinois land trust or, in the case of a transfer by the trustee of an Illinois land trust, the owners of the beneficial interest of the land trust.

P.A. 85–1228, § 3, eff. Nov. 1, 1989. Amended by P.A. 85–1440, Art. III, § 3–12, eff. Nov. 1, 1989; P.A. 86–679, § 1, eff. Sept. 1, 1989.

1 Paragraph 905 of this chapter.

2 42 U.S.C.A. § 11022

3 Chapter 26, ¶ 1–101 et seq

4 Paragraph 906 of this chapter

Historical and Statutory Notes

P.A. 85–1440, Art. III, the First 1989 Technical Corrections Revisory Act, amends various Acts to delete obsolete text, to correct patent or technical errors, and to revise cross-references. For provisions of Art. I, § 1–1, relating to intent and supersedure and Art. IV, § 4–1, relating to effective dates and acceleration of Acts with later effective dates or extension or revival of repealed Acts, see Historical Note following ch. 8, ¶ 37–23.

P.A. 86–679, in the definition of "real property", substituted "notification under Section 9002 of the Solid Waste Disposal Act, as now or hereafter amended (42 U.S.C. 6991)" for "registration with the State Fire Marshall"; rewrote the definition of "transfer", which prior thereto read:

" 'Transfer' means any conveyance of an interest in real property by:

"(1) deed or other instrument of conveyance; or

"(2) a lease of real property whose term, when considering all options which may be exercised, exceeds 40 years; or

"(3) an assignment of more than 25% of the beneficial interest in an Illinois land trust, or which transfers the power of direction thereof; or

"(4) a mortgage or collateral assignment of a beneficial interest in an Illinois land trust

"However, 'transfer' does not include the following: deeds or trust documents which, without additional consideration, confirm, correct, modify or supplement a deed or trust document previously recorded; tax deeds; deeds or trust documents of release of property which is security for a debt or other obligation; deeds of partition; conveyances occurring as a result of a foreclosure of a mortgage or other lien on real property; easements; and conveyances of an interest in minerals, oil or gas ";

rewrote the definition of "transferee", which prior thereto read:

" 'Transferee' means a buyer, mortgagee, grantee or lessee of real property, or an assignee of a greater than 25% interest in an Illinois land trust ";

and in the definition of "transferor", inserted "under a mortgage or trust deed"

Section 3 of P.A. 86–679, approved Sept. 1, 1989, provided:

"This Act shall take effect upon becoming law."

Library References

Words and Phrases (Perm Ed.)

904. Duty to disclose

§ 4. Duty to disclose. (a) For all transfers of real property subject to this Act which occur after January 1, 1990, the transferor shall, within 30 days following execution of a written contract, if any, for the transfer of the property, but not later than 30 days prior to the transfer of real property subject to this Act, deliver to the transferee, if any, and to the lender, if any, a disclosure document. In any transfer which involves multiple transactions including, without limitation, deed and mortgage, sale and leaseback, separate mortgages of fee title and leasehold estate, or creation of a land trust and collateral assignment of the beneficial interest thereunder to secure a loan, the execution of a single disclosure document, in the form provided for in Section 5,[1] by the primary transferor with timely delivery thereof to each transferee and lender involved in the transfer shall satisfy the duty to disclose required by this Section. Such disclosure document shall be in the form and contain the information required in Section 5 of this Act.

(b) The parties to the transfer of real property subject to this Act may waive the time period specified in subsection (a) of this Section 4 if all such parties indicate in writing that they are aware of the purpose and intent of the disclosure document. Notwithstanding the waiver provision contained in this subsection (b) the disclosure document provided for in Section 5 must be delivered to all parties to the real property transfer on or before the date of transfer of the real property.

(c) If the disclosure document reveals environmental defects in the real property which were previously unknown to the parties to the real property transfer or if the

transferor fails to comply with subsection (a) of this Section and fails to obtain a waiver and provide the disclosure as provided for in subsection (b), then any of the parties to the real property transfer may at their discretion, within 10 days after demand for or receipt of the disclosure document, void any obligation to accept a transfer or finance a transfer which has yet to be closed or finalized; provided, however, that nothing contained herein shall be deemed to release a party to the real property transfer from the obligation to pay or reimburse the lender for fees, costs, and expenses.

(d) A failure by any party to the real property transfer to comply with any provision of this Act shall not invalidate in any manner or affect the lien or the priority of any mortgage, trust deed, or collateral assignment of beneficial interest in an Illinois land trust.

P.A. 85–1228, § 4, eff. Nov. 1, 1989. Amended by P.A. 86–679, § 1, eff. Sept. 1, 1989.

[1] Paragraph 905 of this chapter.

Historical and Statutory Notes

P.A. 86–679, in subd (a), inserted the sentence relating to multiple transactions; in subd. (c), added the proviso relating to release from obligation to pay; and added the subdivision providing that noncompliance should not invalidate or affect liens or priorities

905. Form and content of disclosure document

§ 5. Form and content of Disclosure Document. (a) The disclosure document required under Section 4 of this Act [1] shall consist of the following form:

AN ACT to amend certain Acts in relation to environmental protection.

Be it enacted by the People of the State of Illinois, represented in the General Assembly:

Section 1. The Responsible Property Transfer Act of 1988, approved August 30, 1988, as amended, is amended by changing Sections 3, 4, 5, 6, and 7 as follows:

(Ch. 30, par. 903)

Sec. 3. Definitions. As used in this Act:

(a) "Disclosure document" means a document containing the information prescribed in Section 5 of this Act and used to communicate information between the parties to a real property transaction.

(b) "Facility" means all buildings, equipment, structures, and other stationary items which are located on a single site.

(c) "Lender" means any financial institution, insurance company, corporation, partnership, person or other entity which advances funds secured by an interest in real property or collateral assignment of beneficial interest in an Illinois land trust holding title to real property.

(d) "Parties to the real property transfer" means, as applicable, the transferor, transferee, and any lender.

(e) "Real property" means any specific and identifiable parcel of land, including improvements thereon, located within the State of Illinois which has not been subject to bonding or other financial assurances released by the appropriate governmental agency after compliance with applicable State environmental laws, and which:

(1) contains one or more facilities which are subject to reporting under Section 312 of the federal Emergency Planning and Community Right-to-Know Act of 1986, and federal regulations promulgated thereunder; or

(2) has underground storage tanks which require notification under Secion 9002 of the Solid Waste Disposal Act, as now or hereafter amended (42 U.S.C. 6991).

(f) "Specific and identifiable parcel of land" means a portion of real property containing facilities which may be identified by the address provided on reporting forms used to report under Section 312 of the federal Emergency Planning and Community Right-to-Know Act of 1986, and federal regulations promulgated thereunder, or by boundary lines which are provided on such property's applicable Illinois Environmental Protection Agency permit applications. If only a portion of a real property is transferred, then this Act shall only apply to such portion actually being transferred.

(g) "Tranfers" means any conveyance of an interest in real property by:

(1) deed or other instrument of conveyance; or

(2) a lease of real property whose term, when considering all options which may be exercised, exceeds 40 years; or

(3) an assignment of more than 25% of the beneficial interest in an Illinois land trust, or

(4) a mortgage, trust deed, or collateral assignment of a beneficial interest

in an Illinois land trust.

However, "transfer" does not include the following: deeds or trust documents or mortgages or trust deeds or collateral assignments of a beneficial interest in an Illinois land trust, which, without additional consideration, confirm, correct, modify or supplement a document previously recorded; tax deeds; deeds or trust documents of release of property which is security for a debt or other obligation; deeds of partition; conveyances occurring as a result of a foreclosure of a mortgage, trust deed, or other lien on real property; A Uniform Commercial Code sale or other foreclosure of a collateral assignment of a beneficial interest in an Illinois land trust; advances by a lender secured by a previously recorded mortgage, trust deed, or a collateral assignment of a beneficial interset in an Illinois land trust including, without limitation, such advances under line of credit loans and construction loans; modifications, supplements and amendments to existing mortgages, trust deeds, and collateral assignments of beneficial interests in Illinois land trusts which with or without additional consideration do not involve the advancement of additional funds by the lender; easements; and conveyances of an interest in minerals, oil or gas.

(h) "Transferee" means a buyer, trustee under a trust deed (except for purposes of Section 6), mortgagee (except for purposes of Section 6), grantee or lessee of real property, or an assignee (except a collateral assignee for purposes of Section 6) of a greater than 25% interest in an Illinois land trust, or in the case of a transfer to the trustee of an Illinois land trust, the owners of the beneficial interest of the land trust.

(i) "Transferor" means a seller, grantor, mortgagor under a mortgage or trust deed, or lessor of real property, an assignor of a greater than 25% interest, collateral or otherwise, in an Illinois land trust, or, in the case of a transfer by the trustee of an Illinois land trust, the owners of the beneficial interest of the land trust.

(ch. 30, par. 904)

Sec. 4 Duty to disclose.

(a) For all transfers of real property of real property subject to this Act which occur after January 1, 1990, the transferor shall, within 30 days following execution of a written contract, if any, for the transfer of the property, but not later than 30 days prior to the transfer of real property subject to this Act, deliver to the transferee, if any, and to the lender, if any, a disclosure document. In any transfer which involves multiple transactions including, without limitation, deed and mortgage, sale and leaseback, separate mortgages of fee title and leasehold estate, or creation of a land trust and collateral assignment of the beneficial interest thereunder to secure a loan, the execution of a single disclosure document, in the form provided for in Section 5, by the primary transferor with timely delivery thereof to each transferee and lender involved in the transfer shall satisfy the duty to dislcose required by this Section. Such disclosure document shall be in the form and contain the information required in Section 5 of this Act.

(b) The parties to the transfer of real property subject to this Act may waive the time period specified in subsection (a) of this Section 4 if all such parties indicate in writing that they are aware of the purpose and intent of the disclosure document. Notwithstanding the waiver provision contained in this subsection (b) the disclosure document provided for in Section 5 must be delivered to all parties to the real property transfer on or before the date of transfer of the real property.

(c) If the disclosure document reveals environmental defects in the real property which were previously unknown to the parties to the real property transfer or if the transferor fails to comply with subsection (a) of this Section and fails to obtain a waiver and provide the disclosure as provided for in subsection (b), then any of the parties to the real property transfer may at their discretion, within 10 days after demand for or receipt of the disclosure document, void any obligation to accept a transfer or finance a transfer which has yet to be closed or finalized; provided, however, that nothing contained herein shall be deemed to release a party to the real property transfer from the obligation to pay or reimburse the lender for fees, costs, and expenses.

(d) A failure by any party to the real property transfer to comply with any provision of this Act shall not invalidate in any manner or affect the lien or the priority of any mortgage, trust deed, or collateral assignment of beneficial interest in an Illinois land trust.

(Ch. 30, par. 905)

Sec. Form and content of Disclosure Document. (a) The disclosure document required under Section 4 of this Act shall consist of the following form.

Duty to Record
Within 30 days after the date, any real property subject to the provisions of the Responsible Property Transfer Act of is transferred, this completed document must be filed in the office of the recorder of the county in which such property is located and filed with the Illinois Environmental Protection Agency

For Use by County Recorder's Office
County
Date
Doc. No.
Vol.
Page
Rec'd. By

The following information is provided pursuant to the Responsible Property Transfer Act of 1988.

ENVIRONMENTAL DISCLOSURE DOCUMENT FOR TRANSFER OF REAL PROPERTY

Seller:_____
Buyer:_____
Document No.:_____

I. Property Identification:

A. Address of property_____
Street City or Village Township
Permanent Real Estate Index No:_____

B. Legal Description:
Section_____Township_____Range_____
Enter or attach current legal description in this area:

Prepared by: Name_____
Company_____
Address_____
City_____State_____Zip_____

Return to: Name_____
Address_____
_____
_____

Liability Disclosure

Transferors and transferees of real property are advised that their ownership or other control of such property may render them liable for any environmental cleanup costs whether or not they caused or contributed to the presence of environmental problems associated with the property.

C. Property Charicteristics:
Lot Size_____Acreage_____
Check all types of improvement and uses that pertain to the property:
_____ Apartment building (6 units or less)
_____ Commercial apartment (over 6 units)
_____ Store, office, commercial building
_____ Industrial building
_____ Farm, with buildings
_____ Other (specify)

II. Nature of Transfer

A. (1) Is this a transfer by deed or other instrument of conveyance?
Yes_____ No_____
(2) Is this a transfer by assignment of over 25% of beneficial interest of an Illinois land trust?
Yes_____ No_____

(3) A lease exceeding a term of 40 years?
Yes_____ No_____

(4) A mortgage or collateral assignment of beneficial interest?
Yes_____ No_____

B. (1) Identify Transferor:

_____
Name and Current Address of Transferor

_____

Identify Trustee if this is a transfer of beneficial interest of a land trust:

_____
Name and Address of Trustee, Trust No.

_____

(2) Identify person who has completed this form on behalf of the Transferor and who has knowledge of the information contained in this form:

_____
Name, Position (if any), and Address

_____ _____
Telephone No.

C. Identify Transferee:

_____
Name and Current Address of Transferee

_____

III. Notification

Under the Illinois Environmental Protection Act, owners of real property may be held liable for costs related to the release of hazardous substances.

1. Section 22.2(f) of the Act states:
"Notwithstanding any other provision or rule of law, and subject only to the defenses set forth in subsection (j) of this Section, the following persons shall be liable for all costs of removal or remedial action incurred by the State of Illinois as a result of release or substantial threat of a release of a hazardous substance:

(1) The owner and operator of a facility or vessel from which there is a release or substantial threat of release of a hazardous substance;

(2) Any person who at the time of disposal, transport, storage or treatment of a hazardous substance owned or operated the facility or vessel used for such disposal, transport, treatment or storage from which there was a release or substantial threat of a release of any such hazardous substance;

(3) Any person who by contract, agreement, or otherwise has arranged with another party or entity for transport, storage, disposal or treatment of hazardous substances owned, controlled or possessed by such person at a facility [from which] there is a release or substantial threat of release of such hazardous substances; and

(4) Any person who accepts or accepted any hazardous substances for transport to disposal, storage or treatment facilities or sites from which there is a release or a substantial threat of a release of a hazardous substance."

2. Section 4(q) of the Act states:
"The Agency shall have the authority to provide notice to any person who may be liable pursuant to Section 22.2(f) of this Act for a release or a substantial threat of a release of a hazardous substance. Such notice shall include the identified response action and an opportunity for such person to perform the response action."

3. Section 22.2(k) of the Act states:
"If any person who is liable for a release or substantial threat of release of a hazardous substance fails without sufficient cause to provide removal or remedial action upon or in accordance with a notice and request by the agency or upon or in accordance with any order of the Board or any court, such person may be liable to the State for punitive damages in an amount at least equal to, and not more than 3 times, the amount of any costs incurred by the State of Illinois as result of such failure to take such removal or remedial action. The punitive damage imposed by the Board shall be in addition to any costs recovered from such person pursuant to this Section and in addition to any other penalty or relief provided by this Act or any other law."

4. Section 22.18(a) of the Act states:
"Notwithstanding any other provision or rule or law, except as provided otherwise in subsection (b), the owner or operator, or both, of an underground storage tank shall be liable for all costs of preventative action, corrective action and enforcement action incurred by the State of Illinois as a result of a release or a substantial threat of release of petroleum from an underground storage tank."

5. The text of the statutes set out above is subject to change by amendment. Persons using this form may update it to reflect changes in the text of the statutes cited, but no disclosure statement shall be invalid merely because it sets forth an obsolete or superseded version of such text.

IV. Environmental Information

A. Regulatory Information During Current Ownership

1. Has the transferor ever conducted operations on the property which involved the generation, manufacture, processing, transportation, treatment, storage or handling of "hazardous substances", as defined by the Illinois Environmental Protection Act? This question shall not be applicable for consumer goods stored or handled by a retailer in the same form, approximate amount, concentration and manner as they are sold to consumers, provided that such retailer does not engage in any commercial mixing (other than paint mixing or tinting of consumer sized containers), finishing, refinishing, servicing, or cleaning operations on the property.
   Yes_____ No_____

2. Has the transferor ever conducted operations on the property which involved the processing, storage or handling of petroleum, other than that which was associated directly with the transferor's vehicle usage?
   Yes_____ No_____

3. Has the transferor ever conducted operations on the property which involved the generation, transportation, storage, treatment, or disposal of "hazardous or special wastes", as defined by the federal Resource Conservation and Recovery Act and the Illinois Environmental Protection Act?
   Yes_____ No_____

4. Are there any of the following specific units (operating or closed) at the property which are or were used by the transferor to manage waste, hazardous wastes, hazardous substances or petroleum?

Landfill	Yes_____	No_____
Surface Impoundment	Yes_____	No_____
Land Treatment	Yes_____	No_____
Waste Pile	Yes_____	No_____
Incinerator	Yes_____	No_____
Storage Tank (Above Ground)	Yes_____	No_____
Storage Tank (Underground)	Yes_____	No_____
Container Storage Area	Yes_____	No_____
Injection Wells	Yes_____	No_____
Wastewater Treatment Units	Yes_____	No_____
Septic Tanks	Yes_____	No_____
Transfer Stations	Yes_____	No_____
Waste Recycling Operations	Yes_____	No_____
Waste Treatment Detoxification	Yes_____	No_____
Other Land Disposal Area	Yes_____	No_____

If there are "YES" answers to any of the above items and the transfer is other than a mortgage or collateral assigment of beneficial interest, attach a site plan which identifies the location of each unit, such site plan is to be filed with the Environmental Protection Agency along with this disclosure document.

5. Has the transferor ever held any of the following in regard to this real property?
   a. Permits for discharges of wastewaters to waters of the State. Yes___ No___
   b. Permits for emissions to the atmosphere. Yes___ No___
   c. Permits for any waste storage, waste treatment, or waste disposal operation. Yes___ No___

6. Has the transferor had any wastewater discharges (other than sewage) to a publicly owned treatment works? Yes___ No___

7. Has the Transferor taken any of the following actions relative to this property?
   a. Prepared a Chemical Safety Contingency Plan pursuant to the Illinois Chemical Safety Act. Yes___ No___
   b. Filed an Emergency and Hazardous Chemical Inventory Form pursuant to the federal Emergency Planning and Community Right-to-Know Act of 1986. Yes___ No___
   c. Filed a Toxic Chemical Release Form pursuant to the federal Emergency Planning and Community Right-to-Know Act of 1986. Yes___ No___

8. Has the transferor or any facility on the property or the property been the subject of any of the following State or federal government actions?
   a. Written notification regarding known, suspected or alleged contamination on or emanating from the property. Yes___ No___

b. Filing an environmental enforcement case with a court or the Pollution Control Board for which a final order or consent decree was entered. Yes___ No___

c. If item b. was answered by checking Yes, then indicate whether or not the final order or decree is still in effect for this property. Yes___ No___

9. Environmental Releases During Tranferor's Ownership

a. Has any situation occurred at this site which resulted in a reportable "release" of any hazardous substances or petroleum as required under State or federal laws? Yes___ No___

b. Have any hazardous substances or petroleum, which were released, come into direct contact with the ground at this site? Yes___ No___

c. If the answers to questions (a) and (b) are Yes, have any of the following actions or events been associated with a release on the property?

____Use of a cleanup contractor to remove or treat materials including soils, pavement or other surficial materials

____Assignment of in-house maintenance staff to remove or treat materials including soils, pavement or other surficial materials

____Designation, by the IEPA or the IESDA, of the release as "significant" under the Illinois Chemical Safety Act

____Sampling and analysis of soils

____Temporary or more long-term monitoring of groundwater at or near the site

____Impaired usage of an on-site or nearby water well because of offensive characteristics of the water

____Coping with fumes from subsurface storm drains or inside basements, etc.

____Signs of substances leaching out of the ground along the base of slopes or at other low points on or immediately adjacent to the site

10. Is the facility currently operating under a variance granted by the Illinois Pollution Control Board?
Yes_____ No_____

11. Is there any explanation needed for clarification of any of the above answers or responses?

_____
_____
_____
_____
_____

B. Site Information Under Other Ownership or Operation

1. Provide the following information about the previous owner or any entity or person the transferor leased the site to or otherwise contracted with for the management of the site or real property:
Name_____
Type of business or property usage_____

2. If the transferor has knowledge, indicate whether the following existed under prior ownerships, leaseholds granted by the transferor, other contracts for management or use of the facilities or real property:

Landfill	Yes_____	No_____
Surface Impoundment	Yes_____	No_____
Land Treatment	Yes_____	No_____
Waste Pile	Yes_____	No_____
Incinerator	Yes_____	No_____
Storage Tank (Above Ground)	Yes_____	No_____
Storage Tank (Underground)	Yes_____	No_____
Container Storage Area	Yes_____	No_____
Injection Wells	Yes_____	No_____
Wastewater Treatment Units	Yes_____	No_____
Septic Tanks	Yes_____	No_____
Transfer Stations	Yes_____	No_____
Waste Reclying Operations	Yes_____	No_____
Waste Treatment Detoxification	Yes_____	No_____
Other Land Disposal Area	Yes_____	No_____

V. Certification

A. Based on my inquiry of those persons directly responsible for gathering the information, I certify that the information submitted is, to the best of my knowledge and belief, true and accurate

SIGNATURE

Type or print name
TRANSFEROR or TRANSFERORS
(or on behalf of the Transferor)

B. This form was delivered to me with all elements completed on

_____ 19__

SIGNATURE

Type or print name
TRANSFEREE or TRANSFEREES
(or on behalf of the Transferee)

C. This form was delivered to me with all elements completed on

_____ 19__

SIGNATURE

LENDER

This form is specified in the Illinois Responsible Transfer Act (PA 86-679) as passed by the Illinois General Assembly in 1988 and amended in 1989. The legislation that created this disclosure document defines its purpose and specifies who is responsible to file these forms.

It is reproduced here only as an effort to assist with distribution. The Hazardous Waste Research and Information Center and the Illinois Department of Energy and Natural Resources assume no responsibility for information supplied in the forms.

Appendix E

BIBLIOGRAPHY OF PROPERTY TRANSFER LITERATURE

BIBLIOGRAPHY
OF
PROPERTY TRANSFER LITERATURE

Property Transfer Issue

Anderson, D.D. 1990. "The Innocent Landowner Defense; Settlement with de Minimis Landowners Under CERCLA." Hazardous Materials Control, 3(2):14-15.

_____. 1989. "Some Thoughts on CERCLA Settlements." Hazardous Materials Control, 2(6):22-23.

Anderson, E.R., and J. Stanzler. 1990. "Insurance Coverage for Environmental Cleanup." The Journal of Commercial Bank Lending, 72(10):16-23.

Anderson, P.H. 1989. "Regulatory Update: SARA is Spelled Differently in 1989." Hazardous Waste Management, 7(7):6.

Baldwin, M.F. 1985. "Hazardous Waste Problems: Implications for Developers." Urban Land, 44(10):17-21.

Baker, D.H. 1986. "Contemporary Issues in Real Estate Transactions Involving Environmental Concerns." Industrial Development, 155(2):2-3.

Baker, R.L., and M.J. Markoff. 1986. "By-Products Liability: Using Common Law Private Actions to Clean Up Hazardous Waste Sites." The Harvard Environmental Law Review, 10(1):99-134.

Beatley, P. 1989. "Environmental Considerations for Foreign Direct Investment in the U.S." Industrial Development, 158(2):4-5.

Bezer, D.L., and B.S. Phillips. 1990. "Contaminated Property Valuation Issue: An Overview." Site Selection, Industrial Development Section, 159(3):1-2.

Boyer, G.T., and R.A. Jasaitis. 1987. "Experiences with New Jersey's Environmental Cleanup Responsibility Act: Heaven or Hell?" 42nd Purdue University Industrial Waste Conference Proceedings; May 12-14, 1987; Purdue University, Lafayette, IN, 29-32.

Brewer, J. 1982. "The Impact of RCRA and Superfund on Land Transactions." Industrial Development, 151(2):10-13.

Brown, J.J. 1987. "Review of Environmental Developments in Springfield." Environmental Control Law, 18(2):1-3.

Buonicore, A.J. 1989. "Environmental Liabilities in Financing Real Estate." The Real Estate Finance Journal, (Summer):18-25.

Burcat, J.R. 1986. "Environmental Liability of Creditors: Open Season on Banks, Creditors, and Other Deep Pockets." The Banking Law Journal, 103 (November-December):509.

Burhenn, D.W., and B.P. Howard. 1988. "Lender Liability." California Real Property Journal, 6(2):17-22.

Campanella, A.W. 1987. "New Environmental Insurer May Add to Coverage Options." Cashflow Magazine, 8(September):26.

Chambers, J.C., and P.L. Gray. 1989. "EPA and State Roles in RCRA and CERCLA." Natural Resources Environment, 4(2):7-10, 43-44.

Chesler, A.R. 1987. "Negotiating the Environmental Issues in Real Estate Contracts." Industrial Development, 156(3):19-22.

Civins, J., and G.S. Lipe. 1988. "Environmental Problems and Broker Liability." Natural Resources & Environment, 3(Fall):17-19.

Clark, J.E., and T.O. Kelly. 1987. "Lender Liability for Environmental Claims." The Journal of Commercial Bank Lending, 69(January):55-58.

Commins, J.A. 1990. "Environmental Audits Revisited." The Journal of Commercial Bank Landing, 72(9):13-17.

Cristal, J.K. 1987. "Federal and State Statutory Liability of Successor Landowners for Groundwater Pollution." International Property Investment Journal, 3:301-24.

Davidson, C.E. 1989. "Corporate Ownership of Real Estate: The Impact of Environmental Legislation on Shareholder Liability." Real Estate Law Journal, 17(4):291-312.

Donley Technology. 1988--. The Environmental Liability Report: For Real Estate Buyers, Sellers, and Consultants. Garrisonville, VA: Donley Technology.

Feldman, L. 1985. "The Role of Environmental Site Assessments in Reducing Lender Risk in Massachusetts." Environmental Progress, 4(3):178-81.

Fields, R.W. 1990. "Developing a Strategy for Environment Claims." Risk Management, 37(2):36-39.

Forte, J.P. 1987. "A Lender's Guide to Environmental Liability Risk Management." Mortgage Banking, 48(May):53-60.

Freeman, G.C. 1986. "Tort Law Reform: Superfund/RCRA Liability as a Major Cause of the Insurance Crisis." Tort & Insurance Law Journal, 21(4):517-42.

Gaba, J.M. 1986. "Recovering Hazardous Waste Cleanup Costs: The Private Cause of Action Under CERCLA." Ecology Law Quarterly, 13(2):181-233.

Glass, E.A. 1988. "Superfund and SARA: Are There Any Defences Left?" The Harvard Environmental Law Review, 12(2):385-464.

_____. 1987. "The Modern Snake in the Grass: An Examination of Real Estate and Commercial Liability Under Superfund and SARA and Suggested Guidelines for the Practitioner." Boston College of Environmental Affairs Law Review, 14:381-446.

Glenn, M.K., and R.E. Steinberg. 1987. "The Environmental Liability Crisis." The Bankers Magazine, 170(3):38-41.

Goodman, G.A. 1990. "Asbestos: Landlord-Tenant Issues." Site Selection, Industrial Development Section, 159(3):3-4.

Gray, K., and D.P. Pike. 1989. "Turning on the Lights: Reporting Under SARA Title III Illuminates Tort and Environmental Liabilities." The Environmental Professional, 11:56-63.

Grigalunas, T.A., and J.J. Opaluch. 1988. "Assessing Liability for Damages Under CERCLA: A New Approach for Providing Incentives for Pollution Avoidance?" Natural Resources Journal, 28:509-33.

Hanson, K.E., and A. Babich. 1988. "Taking Charge: Local Governments and Hazardous Substances." New Jersey Municipalities, 65(7):24, 64-66.

Havey, J.M. 1985. "Trial of the Groundwater Contamination Case." The Brief, 14(2):31-36.

Hedeman, W.M., P.E. Shorb, and C.A. McLean. 1987. "The Superfund Amendments and Reauthorization Act of 1986: Statutory Provisions and EPA Implementation." Hazardous Waste & Hazardous Materials, 4(2):193-210.

Hinds, R.C. 1982. "Liability Under Federal Law for Hazardous Waste." The Harvard Environmental Law Review, 6(1):1-34.

Hitt, M.E. 1989. "Desperately Seeking SARA: Preserving the Innocent Landowner Defense to Superfund Liability." Real Estate Law Journal, 18(1):3-26.

Hoskins, J.C. 1987. "Environmental Considerations in the Disposal or Acquisition of Corporate Real Estate." Industrial Development, 156(6):1-6.

Hughey, R.E., and A.J. McMahon. 1985. "New Jersey: A New Tactic Against Hazardous Waste." EPA Journal, 11(3):16-17.

Hurwitz, A. 1985. "Managing a Dump Site Case." The Brief, 14(2):41-45.

Illinois Department of Commerce and Community Affairs. 1989. "Responsible Property Transfer." Illinois Economic Report, 8(2):8-9.

Illinois Environmental Regulatory Group. 1988. Policy Guidance Document: Responsible Property Transfer. Springfield, IL: Illinois State Chamber of Commerce.

Illinois General Assembly. 1989. Responsible Property Transfer Act, PA 86-679 (September). Springfield, IL.

Imbler, C.C. 1987. "Pollution Liability." The Corporate Board, 8(May/June):13-17.

Italiano, M.L., J.M. Staller, and B.P. Sullivan. 1989. "Expediting Waste Site Cleanups by Initiating Citizen Settlements." Toxic Law Reporter, 3(35):1062-71.

Jaben, J. 1990. "Environmental Issues Continue to Confront the Real Estate Industry." National Real Estate Investor, 32(6):78-86.

Jones, S.D. 1988. "Drafting CERCLA Consent Degrees." Natural Resources & Environment, 3(1):31-33, 52.

Kaplan, L.E. 1988. "A Compendium of Hazardous Substance Laws and Issues Involving Real Estate." Industrial Development, 157(1):13-21.

Klein, G.E. 1986. "Hazardous Waste Liability and the Bankruptcy Code." The Harvard Environmental Law Review, 10(2):533-62.

Klemens, M.D. 1988. "Environmental Pedigree Before Business Property Sold." Illinois Issues, 14(December):25.

Koelbel, M.T. 1986. "The Impact of State 'Superlien' Statutes on Real Estate Transactions." Virginia Journal of Natural Resources Law, 5(2):297-322.

Kopitsky, J.J., and E.T. Betzenberger. 1987. "Should Banks Lend to Companies with Environmental Problems?" The Journal of Commercial Bank Lending, 69 (11):3-13.

Kozuchowski, J.S. 1988. "Danbury's SARA Success Story." Pollution Engineering, 20(4):78-80.

Last, M.P. 1988. "Superfund Liability Traps Affecting Developers and Lenders." Natural Resources & Environment, 3(3):10-12, 43-45.

Leighton-Smith, S. 1987. "Issue in Lending . . . The New Innocent Party Defense Under SARA." The Journal of Commercial Bank Lending, 69(July):20-25.

"Liability of Parent Corporations for Hazardous Waste Cleanup and Damages." 1986. Harvard Law Review, 99:986-98.

Lockett, L. 1984. "Environmental Liability Enforcement and the Bankruptcy Act of 1978: A Study of H.R. 2767, the 'Superlien' Provision." Real Property, Probate, and Trust Journal, 19(3):859-90.

Lyne, J. 1985. "Survey Suggests Laws on Reuse of Industrial Sites Toughening in Many States." Industrial Development/Site Selection Handbook, 154(October):884-88.

McClain, K.T. 1987. "Old Landfills/New Problems." Environmental Control Law, 18(1):2.

McMahan, J. 1989. "Environmental Hazards and Real Estate." Real Estate Issues, 14(1):1-6.

McMahon, T., and K. Moertl. 1988. "The Erosion of Traditional Corporate Law Doctrines in Environmental Cases." Natural Resources & Environment, 3(3):29-31, 55-56.

McPheeters, B.B. 1980. "Inactive or Abandoned Hazardous Waste Disposal Sites: Coping with a Costly Past." Southern California Law Review, 53(6):1709-45.

Margolis, J., P. Eagan, and M. Weiss. 1987. "Facility Closures and Sales: Legal Requirements and Profit Opportunities." Proceedings of International Congress on Hazardous Materials Management. Northbrook, IL: Pudvan Publishing Company, 745-62.

Marzulla, R.J. 1990. "Superfund '91 -- Congress' Chance to Clean Up Its Act." Risk Management, 37(4):32-40.

Mellor, W.H. 1986. "Warning: Hazardous Wastes May be Harmful to Your (Financial) Health." The Business Lawyer Update, 6(4):4-5, 7-8.

Metzner, M.A. 1990. "Traps for the Unwary: The Expanding Liability Under CERCLA for Past Owners, Current Owners, and Arrangers." Toxic Law Reporter, 4(33):959-64.

Miller, L.R. 1988. "New Jersey's Improved ECRA Implementation: The State Answers Its Critics." Environmental Law Reporter, 18(3):10084-86.

Minzt, J.A. 1987. "Abandoned Hazardous Waste Sites and the RCRA Imminent Hazard Provision: Some Suggestions for a Sound Judicial Construction." The Harvard Environmental Law Review, 11(1):247-324.

Molinari, T. 1989. "SARA Title III Provisions Should Be Added to Site Selectors' Checklists." Industrial Development, 158(1):22-23.

Morse, H.N. 1988. "The Applicability of ECRA." Journal of Air Pollution Control Association, 38(10):1353.

Newman, R. 1988. "Property Transactions and Hazardous Waste." Hazardous Waste Management, 6:12-13.

Newman, J. 1988. "Real Estate Transaction Environmental Considerations." Pollution Engineering, 20(9):100-104.

Olson, H.J. 1987. "ECRA: New Jersey's Cleanup Statute." Environmental Law Reporter, 57(10):10395-99.

Pascale, D. 1989. "ECRA and RPTA: Alphabet Soup, New Jersey and Illinois Style." Environmental Control Law, 19(2):8-9.

Paulsen, F.S. 1987. "Managing Hazardous Waste Risks Under the Massachusetts 'Superfund' Law." Environmental Progress, 6(4):236-39.

Patchin, P.J. 1988. "Valuation of Contaminated Properties." The Appraisal Journal, 56(1):7-17.

Pedowitz, J.M. 1985. "Title Insurance: Non-Coverage of Hazardous Waste Super-Liens." Probate and Property, 13(4):46-47.

Perry, C. 1987. "The Superfund Amendments--A New Beginning." Industrial Development, 156(1):4-5.

Peterson, J.M. 1986. "RCRA Enforcement Provisions After the 1984 Amendments." Virginia Journal of Natural Resources Law, 5(2):323-50.

Phillips, S.J. 1985. "Hazardous Waste Cases." The Brief, 14(2):37-40.

Pilko, G., and F. Geer. 1987. "Avoiding Hazardous Waste Pitfalls in Real Estate Transactions." Industrial Development, 156(6):7-9.

Pridmore, J. 1986. "Plant Acquisition Becomes Risk Management Problem." Cashflow Magazine, 7(January):5-6.

Raskin, J. 1987. "Federal and State Statutory Liability of Successor Landowners for Groundwater Pollution." International Property Investment Journal, 3(October):301-24.

Rodburg, M.L. 1988. "Landlords and Tenants in the Age of the Environment." Natural Resources & Environment, 3(3):13-16.

Russell, R.M. 1989. "Environmental Liability Considerations in the Valuation and Appraisal of Producing Oil and Gas Properties." Journal of Petroleum Technology, 41(1):55-58.

Scagnelli, J.M., and B.C. Malloy. 1987. "Should Lenders Require Environmental Audits?" The Journal of Commercial Bank Lending, 69(11):14-19.

Schwenke, R.D. 1989. Hazardous Waste: Hazardous Headache to Borrowers and Lenders. Tampa, FL: Schwenke, Carlton, Fields, Ward, Emanuel, Smith & Cutler.

Shumate, J.D. 1987. "Environmental Law: An Emerging Threat to Financial Institutions." Bank Administration, 63(February):44-46.

Sidley & Austin Law Offices. 1987. Superfund Handbook: A Guide to Managing Response to Toxic Releases Under Superfund Amendments and Reauthorization Act. 2nd ed. Chicago: Sidley & Austin.

Stokes, J. 1986. "Legal Aspects of Real Estate Transactions Involving Environmental Concerns." Industrial Development, 155(5):10-14.

"Superfund: A Game of Chance." 1985. Natural Resources & Environment, 1(3):3-33.

Tarlock, D.A. 1985. "Prevention of Groundwater Contamination." Zoning and Planning Law Report, 8(5):121-27.

Tasher, S.A., and B.F. Kaufman. 1988. "A Guide to New Jersey's Environmental Cleanup Responsibility Act." Natural Resources & Environment, 3(3):26-28, 50-52.

Thunder, J.M. 1986. "Federal Environmental Laws and the Liability of Quasi-Sources." The Harvard Environmental Law Review, 10(2):467-502.

"Toxic Real Estate: Feature Report." 1989. Hazmat World, 2(3):29-53.

"Toxic Waste is Banks' Latest Hazard." 1990. United States Banker, 100(5):58, 76.

"Toxic Waste Worries Spur New Bills." 1990. Banking Journal, 82(5):8, 10, 14.

Trani, J. 1988. "Recognizing the Threat of Hazardous Waste." Journal of Property Management, 53(Jan-Feb):14-17.

Tremblay, J.W., and J.F. Neyens. 1984. "RCRA and Superfund." Industrial Development, 153(6):11-12.

Tupi, B.S. 1989. "Guidice v. BFG Electroplating: Expanded CERCLA Liability for Foreclosing Lenders." Toxic Law Reporter, 4(29):844-50.

Wade, A. 1987. "Loan Pollution." United States Banker, (November):40-43.

Wagner, W.E. 1989. "Liability for Hazardous Waste Cleanup: An Examination of New Jersey's Approach." The Harvard Environmental Law Review, 13(1):245-312.

Waldstein, S. 1988. "A Toxic Nightmare on Elm Street: Negligence and the Real Estate Broker's Duty in Selling Previously Contaminated Residential Property."

Boston College of Environmental Affairs Law Review, 15(Spring):547-91.

Warrock, A.M. 1986. "Lenders and Insurers Respond to the Superlien Law." New England Business, 8(November 17):69-70.

White, T., and C. Snyder. 1989. "Property Owners Nightmare: Tenant Scoots, Leaves Site Contaminated with Hazardous Waste." Hazardous Waste Management, 7(7):30-32.

Williams, E.E., and M.M. McGuire. 1987. "CERCLA, RCRA, and a Corporate Acquisition: The New Caveat Emptor." Proceedings of International Congress on Hazardous Materials Management. Northbrook, IL: Pudvan Publishing Company, 298-311.

Zimmerman, L.S. 1988. "Environmental Issues in Sales Transactions: The Seller's Perspective." Natural Resources & Environment, 3(3):7-9.

Site Assessment Techniques

Anderson, W.A., and M.E. Taylor. 1988. "Representing Buyers." Natural Resources & Environment, 3(3):3-6, 39-41.

Andrews, R.N. 1987. "Local Planners and Hazardous Materials." Journal of the American Planning Association, 53(1):3-5.

Anthony, S.F. 1985. "Groundwater Pollution Control: A National Aim, A Regional Strategy." Pace Environmental Law Review, 2:215-43.

ASFE/Association of Engineering Firms Practicing in the Geosciences. 1989. Preacquisition Site Assessments: Recommended Management Procedures for Consulting Engineering Firms. Silver Spring, MD: ASFE.

Baker, D.H. 1987. "Environmental Investigations and Cleanup Solutions Preceding Real Estate Transfers." Industrial Development, 156(5):12-14.

Bennett, M.J. 1989. "Environmental Due Diligence: An Evolving National Standard." Toxic Law Reporter, 3(40):1262-66.

Born, S.M., Yanggen, D.A., and Z. Zaporozec. 1987. A Guide To Groundwater Quality Planning and Management for Local Governments. Wisconsin Geologic and Natural History Survey, Special Report 9. Madison, WI.

Bourdeau, K. 1986. "Minimizing Hazardous Waste Liabilities in Real Estate Transactions." The Construction Lawyer, 6(4):3,19.

Brant, W.M. 1987. "Dade County's Site Assessment and Cleanup Program." Industrial Development, 156(4):11-13.

Cheremisinoff, P.N., and J. Teneyck. 1987. "Environmental Auditing: A Basic Guide." Pollution Engineering, 19(4):72-75.

Connolly, J.J., P.J. Croteau, and K.M. Burger. 1989. "The Necessity of and Methods for Conducting Environmental Site Assessments of Real Estate Prior to Purchase." The Environmental Professional, 11(1):1-7.

Duffala, D.S., and M. Miller. 1988. "Environmental Audits for Industrial Property Transfers." Paper Presented at the Water Pollution Control Federation Annual Conference, Dallas, TX, October 3, 1988, Session No. 11.

Erb, T., et al. 1981. "Analysis of Landfills with Historic Airphotos." Photogrammetric Engineering and Remote Sensing, 47:1363-69.

Evans, P.B. 1988. "Environmental Audits of Real Property Before Purchase." Natural Resources & Environment, 3(Fall):23-25.

Evans, R.B., and G.E. Schweitzer. 1984. "Assessing Hazardous Waste Problems." Environment, Science and Technology, 18(November):330-36.

Federal Home Loan Bank, Office of Regulatory Activities. 1989. "Environmental Risk and Liability." Thrift Bulletin #16, Section 210 (February 6, 1989).

Ferguson, J.T. 1990. "Detecting Environmental Risk." Mortgage Banking, 50(8):69-73.

Finkelstein, L., J.T. Hansen, and M.J. Steel. 1988. "Buying Contaminated Property: How to Avoid a Toxic Surprise." California Real Property Journal, 6(2):1-9.

Fusco, N. 1990. "Safe Surveying of Hazardous Sites." Professional Surveyor, 10(9):24-26.

Getz, T.J., J.C. Randolph, and W.F. Echelberger. 1982. "Environmental Application of Aerial Reconnaissance to Search for Open Dumps." Environmental Management, 7(6):553-62.

Goss, F.D., ed. 1989. Environmental Evaluations for Real Estate Transactions: A Technical and Business Guide. Rockville, MD: Government Institutes, Inc.

Greenberg, M.R. 1987. "Sampling Strategies for Finding Contaminated Land." Applied Geography, 7:197-202.

Illinois Environmental Protection Agency, Division of Public Water Supplies. 1988. A Primer Regarding Certain Provisions of the Illinois Groundwater Protection Act. Springfield, IL.

Jones, R.D. 1988. "Watch Out for the Hidden Threat: Lenders Tell How." Mortgage Banking, 48(January):44-50.

Jones, S.C. 1987. "Toxic Contamination and Liability: Precautionary Action and Post-Discovery Alternatives." Industrial Development, 156(2):4-7.

Kane, R.W. 1990. "Screening Real Estate for Environmental Problems." The Journal of Commercial Bank Lending, 72(11):4-12.

_____. 1988. "Avoiding Liability When Purchasing Property Through Environmental Auditing and Risk Assessment." Environmental Management Report, 7(First Quarter):97-117.

Kane, R.W., and L.B. Cahill. 1990. "Keeping Surprises from Popping Out at You." Real Estate Today 23(6):62-65.

Kowalenko, E., et. al. 1990. Environmental Property Assessments: Environmental Liabilities in Property Transfers and the Illinois Responsible Property Transfer Act. Chicago: School of Public Health, University of Illinois at Chicago.

"Lender's Strategies for Environmental Assessment." 1988. Mortgage Banking, 48(July):65-72.

Levin, M.H., and K.W. Smith. 1990. "Is 'Innocence' Bliss?" Journal of the Air and Waste Management Association, 40(5):608, 610.

Lyon, J. 1987. "Use of Maps, Aerial Photographs, and Other Remote Sensor Data for Practical Evaluations of Hazardous Waste Sites." Photogrammetric Engineering and Remote Sensing, 53:515-19.

McGregor, G.I. 1988. Transportation Agency Liability for Hazardous Waste: A Practical Approach to Minimizing Legal, Financial, and Environmental Risks. Boston: McGregor, Shea & Doliner.

Mang, J.L. 1986. "A Review of Technical Approaches to a Cleanup." Industrial Development, 155(2):5-6.

Mason, J.T. 1985. "Environmental Record Searches." Nuclear and Chemical Waste Management, 5:333-36.

Matonis, P.M., and B.H. Jordan. 1988. "A Practical Guide to Environmental Investigations and the Use of Environmental Consultants in Real Estate Transactions." California Real Property Journal, 6(2):10-16.

Mauch, J.C. 1990. "Site Assessment Standards Sorely Needed." Hazmat World, 3(3):36-39.

_____. 1989. "A Proposed Solution to the Uncertainty Surrounding the Innocent Landowner Defense." Toxic Law Reporter, 4(25):744-49.

Miller D. 1986. "The Components of a Facility Review." Industrial Development, 155(2):4.

Molinari, T., and K. Philbrick. 1990. "A Pre-Purchase Environmental Checklist for Corporate Site Selectors." Site Selection, Industrial Development Section, 159(3):5-7.

Moskowitz, J.S. 1989. Environmental Liability and Real Estate Transactions: Law and Practice. New York: Wiley and Sons.

Nucciarone, P.A., ed. 1989. The Impact of Environmental Regulations on Business Transactions: Real Property Transfers and Mergers and Acquisitions Program. New York: Practising Law Institute.

Olsen, R.K. 1989. "Hazardous Waste Sites." The Appraisal Journal, 57 (2):233-37.

Ouellette, R.P., and B. Maestri. 1989. "The Process and Cost of Environmental Audits." Hazmat World, 2(10):57-61.

Payne, J.L. 1989. "A Practical Approach to Environmental Audits." Practical Real Estate Lawyer, 5(5):83-93.

_____. 1986. "Pre-Acquisition Site Audits and Waste Cleanup." Industrial Development, 155(4):15-17.

Raymond, L.S. 1985. "Conducting Groundwater Pollution Investigations as a Community Project: Feasibility and Usefulness." In Papers and Proceedings of Applied Geography Conferences, Vol. 8; Denton, TX; October 17-19, 1985; 99-108.

"Real Estate Site Assessments: Feature Report." 1990. Hazmat World, 3(3):35- 69.

Rohrman, D.F., and M.J. Hoffman. 1989. "Environmental Audits: Assessing Environmental Liability in Real Estate Transactions." Illinois Bar Journal, 77(September):1-5.

Schiffman, D.I., and P.W. Dennis. 1988. "A Practical Guide to Environmental Investigations and the Use of Environmental Consultants in Real Estate Transactions." California Real Property Journal, 6(2):10-16.

Shirazi, M.A. 1983. "Land Classification Used to Select Abandoned Hazardous Waste Study Sites." Environmental Management, 8(4):281-86.

Simms, D.L., and M.J. Beckett. 1987. "Contaminated Land: Setting Trigger Concentrations." The Science of the Total Environment, 65:121-34.

Slone, D.K. 1989. "Assessing Off-Site Groundwater Contamination Sources in Real Estate Transactions." Hazardous Materials Control, 2(3):34-37.

Squire, D.H., and R.J. Martineau. 1988. "Environmental Consultants: Getting Your Money's Worth." Natural Resources & Environment, 3(Fall):23-25.

Stirling, D.A. 1990. "Site Histories in Environmental Assessments: A New Opportunity for Public Historians." Public Historian, 12(2):45-52.

Tillman, N., K. Ranlet, and T.J. Meyer. 1989. "Soil Gas Surveys: Part I." Pollution Engineering, 21(7):86-89.

_____. 1989. "Soil Gas Surveys: Part II/Procedures." Pollution Engineering, 21(8):79-84.

Varney, T.C. 1989. "Environmental Audits Can Protect You." Pollution Engineering, 21(1):108, 110.

Vogel, R.M. 1980. "Quadrangular Treasure: The Cartographic Route to Industrial Archeology." IA: The Journal of the Society for Industrial Archeology, 6:25-56.

White, A.L. 1984. "The Site History: A Tool for Risk Management." Hazardous Waste, 1(4):533-43.

Wright, H. 1983. "Insurance Mapping and Industrial Archeology." IA: The Journal of the Society for Industrial Archeology, 9:1-18.

Young, R., et al. 1982. "Methodology for Assessing Uncontrolled Site Problems at the County Level." In Risk Assessment at Hazardous Waste Sites, edited by G. Schweitzer and F. Young. New York: American Chemical Society, 55-71.

Waste Management History

Anderson, R.F., and M.R. Greenberg. 1982. "Hazardous Waste Facility Siting." Journal of the American Planning Association, 48:204-18.

Besselievre, E.B. 1952. Industrial Waste Treatment. New York: McGraw-Hill.

_____. 1931. "The Disposal of Industrial Chemical Wastes." Chemical Age, 25:516-18.

Bayliss, J.R. 1933. "Effects of Certain Industrial Wastes." Civil Engineer, 3:522-24.

Brown, M. 1981. Laying Waste: The Poisoning of America by Toxic Chemicals. New York: Washington Square Press.

Bruttini, A. 1923. Uses of Waste Materials. London: King and Son.

Cain, L. 1974. "Unfouling the Public's Nest: Chicago's Sanitary Diversion of Lake Michigan's Water." Technology and Culture, 15:594-613.

Cairney, T., ed. 1987. Reclaiming Contaminated Land. Glasgow, Great Britain: Blackie & Son, Ltd.

Coates, V.L., T. Fabian, and M. McDonald. 1982. Nineteenth Century Technology--Twentieth Century Problems: A Retrospective Mini-Assessment. U.S. Environmental Protection Agency, EPA-600/9-82-011. Washington, DC.

Coburn, S.E. 1928. "Disposal of Acid-Iron Wastes from a Steel Mill." Industrial and Engineering Chemistry, 20:248-49.

Cohan, D., K.D. Runke, and D.S. Wilson. 1987. "Risk Management Analysis of Manufactured Gas Plant Waste Sites." Proceedings of International Congress on Hazardous Materials Management. Northbrook, IL: Pudvan Publishing Company, 272-85.

Colten, C.E. 1988a. "Historical Geographic Identification of Hazardous Waste Disposal Sites: Illinois Examples." The Environmental Professional, 10:54-61.

_____. 1988b. "Historical Questions in Hazardous Waste Management." The Public Historian, 10(Winter):7-20.

_____. 1988c. "Industrial Middens in Illinois: The Search for Historical Hazardous Wastes, 1870-1980." IA: The Journal of the Society for Industrial Archeology, 14(2):51-61.

_____. 1986. "Industrial Wastes in Southeast Chicago: Production and Disposal, 1870-1970." Environmental Review, 10(2):93-105.

_____. 1985. Industrial Wastes in the Calumet Area, 1869-1970: An Historical Geography. Illinois Department of Energy and Natural Resources, Hazardous Waste Research and Information Center, Research Report 001. Savoy, IL.

Colten, C.E., and G.E. Breen. 1986. Historical Industrial Waste Disposal Practices in Winnebago County, Illinois, 1870-1980. Illinois Department of Energy and Natural Resources, Hazardous Waste Research and Information Center, Research Report 011. Savoy, IL.

Colten, C.E., and T.B. Samsel. 1988. Historical Assessment of Hazardous Waste Management in Madison and St. Clair Counties, Illinois, 1890-1980. Illinois Department of Energy and Natural Resources, Hazardous Waste Research and Information Center, Research Report 030. Savoy, IL.

Cowdrey, A. 1975. "Pioneering Environmental Law: The Army Corps of Engineers and the Refuse Act." Pacific Historical Review, 44:331-49.

Dobson, J.G. 1947. "Disposal of Cyanide Wastes." Metal Finishing 45:68-71, 78-81.

Eliassen, R., and C.N. Sawyer. 1942. "Treatment of a Defense Plant Waste." Water Works and Sewerage, 89:532-34.

Eldridge, E.F. 1942. Industrial Waste Treatment Practice. New York: McGraw-Hill.

_____. 1933. "Reducing the Toxicity of Cyanide Wastes." Engineering News-Record, 111:677.

Emberton, J.R., and A. Parker. 1987. "The Problems Associated with Building on Landfill Sites." Waste Management and Research, 5:473-82.

Friel, F.S., and G.J. Wiest. 1945. "Cyanide Removal from Metal Finishing Wastes." Water Works and Sewerage, 92:97-98.

Gehm, H.W. 1942. "Recovery of Chemicals from Pickling Liquor and Copperas Waste." Industrial and Engineering Chemistry, 34:382-84.

Gibbons, M.M. 1932. "Elimination of Tastes and Odors of Industrial Origin from Public Water Supplies." Industrial and Engineering Chemistry 24:977-82.

Gould, J.M. 1986. Quality of Life in American Neighborhoods: Levels of Affluence, Toxic Waste, and Cancer Mortality in Residential Zip Code Areas. Boulder, CO: Westview Press.

Gravel, T. 1990. "Dishonorable Discharges: The Military's Peacetime War on Planet Earth." E Magazine, 1(4):43-45, 64-65.

Greenberg, M.R., and R.F. Anderson. 1984. Hazardous Waste Sites: The Credibility Gap. New Brunswick, NJ: Center for Urban Policy Research.

Hall, F. 1919. "Reclaiming Steel Works and Industrial Wastes." Chemical and Metal Engineering 20:326-27.

Hill, J.B. 1939. "Waste Problems in the Petroleum Industry." Industrial and Engineering Chemistry, 31:1361-63.

Hodge, W.W. 1939. "Waste Problems of the Iron and Steel Industry." Industrial and Engineering Chemistry, 31:1364-80.

Hoover, C.R., and J.W. Masselli. 1941. "Disposal of Waste Liquors from Chromium Plating." Industrial and Chemical Engineering, 33(January):131-34.

Hurley, A. 1988. "The Social Biases of Environmental Change in Gary, Indiana, 1945-1980." Environmental Review, 12(4):1-19.

Illinois Rivers and Lakes Commission. 1915. Stream Pollution and Sewage Disposal with Reference to Public Policy and Legislation. Bulletin 16. Chicago, IL.

Illinois State Sanitary Water Board, Division of Sanitary Engineering. 1949. Data on Municipal Sewerage Works. Springfield, IL.

Illinois State Water Survey. 1927. Pollution of Streams in Illinois. Bulletin 24. Champaign, IL.

Katz, S.L. 1986. "Hazardous Waste on Public Lands." Natural Resources & Environment, 2(1):14-17.

Kingsbury, G.L., and R.M. Ray. 1986. Reclamation and Redevelopment of Contaminated Land: Vol. I, U.S. Case Studies. U.S. Environmental Protection Agency, Office of Research and Development, Hazardous Waste Engineering Research Laboratory. EPA/600/2-86/066. Cincinnati, OH.

Lanphear, R.S. 1931. "The Treatment of Sewage Containing Industrial Wastes." Sewage Works Journal, 3:276-83.

Lindorff, D.E., and K. Cartwright. 1977. Ground-Water Contamination: Problems and Remedial Actions. Illinois State Geological Survey, Environmental Geology Notes No. 81. Urbana, IL.

McCord, C. 1931. Industrial Hygiene for Engineers. New York: Harper and Brothers.

Melosi, M.V. 1988. "Hazardous Waste and Environmental Liability: An Historical Perspective." Houston Law Review, 25(4):741-79.

_____. 1981. Garbage in the Cities: Refuse, Reform, and the Environment, 1880-1980. College Station, TX: Texas A & M University Press.

Mohlman, F.W. 1949. "Sewage and Industrial Wastes in 1948." Water and Sewage Works, 96:43-54.

_____. 1946. "Sewage and Industrial Wastes in 1945." Water and Sewage Works, 93:45-56.

_____. 1944. "Industrial Wastes in Wartime." Journal of American Water Works Association, 36:1121.

Pisani, D. 1984. "Fish Culture and the Dawn of Concern Over Water Pollution in the United States." Environmental Review, 8:117-31.

_____. 1974. "The Polluted Truckee: A Study in Interstate Water Quality, 1870-1934." Nevada Historical Quarterly, 20:150-66.

Pratt, J.A. 1980. "Letting the Grandchildren Do It: Environmental Planning During the Ascent of Oil as a Major Energy Source." Public Historian, 2(4):28-61.

Rudolfs, W., ed. 1953. Industrial Wastes: Their Disposal and Treatment. New York: Reinhold.

_____. 1935. "Recent Trade Waste Treatment Methods." Sewage Works Journal, 7:713-25.

Snell, F.D. 1934. "Treatment of Waste from Dyeing and Printing." Industrial and Engineering Chemistry, 26:580-81.

Swain, R.E. 1939. "Waste Problems in the Nonferrous Smelting Industry." Industrial and Engineering Chemistry, 31:1358-61.

Tarr, J. 1985a. "Historical Perspectives on Hazardous Wastes in the United States." Waste Management and Research, 3:95-102.

_____. 1985b. "Industrial Wastes and Public Health: Some Historical Notes, Part I, 1876-1932." American Journal of Public Health, 75:1059-67.

_____. 1984. "The Search for the Ultimate Sink: Urban Air, Land, and Water Pollution in Historical Perspective." Records of the Columbia Historical Society, 51:1-29.

Tarr, J.A., J. McCurley, F.C. McMichael, and T. Yosie. 1984. "Water and Wastes: A Retrospective Assessment of Wastewater Technology in the United States." Technology and Culture, 25:226-63.

Tarr, J., and F.C. McMichael. 1977. "The Evolution of Wastewater Technology and the Development of State Regulation." Retrospective Technology Assessment--1976, edited by Joel A. Tarr, San Francisco: San Francisco Press, 165-90.

U.S. Department of Health, Education, and Welfare. 1957. Municipal and Industrial Waste Facilities: Region V, Vol. 5. Washington, DC.

U.S. Environmental Protection Agency, Center for Environmental Research Information and Office of Drinking Water. 1985. Seminar Publication-Protection of Public Water Supplies from Ground-Water Contamination. Cincinnati, OH.

Wilson, D.G., and E.T. Smith. 1981. "Uncontrolled Hazardous Waste Sites: A Perspective of the Problem in the U.K." Toxic Substances Journal, 3(1):71-83.

Winograd, I.J. 1986. Archaeology and Public Perception of a Transscientific Problem: Disposal of Toxic Wastes in the Unsaturated Zone. U.S. Geological Survey Circular 990. Washington, DC.

History of Industrial Technology

"Barren Areas Treated for Dust Control." 1966. Public Works, 97(October):114-15.

Benarde, M.A. 1990. "History and State of the Problem." In Asbestos: The Hazardous Fiber. Edited by M.A. Benarde. Boca Raton, FL: CRC Press, Inc., 1-12.

Berg, G.G. 1969. Chemical Fallout: Current Research on Persistent Pesticides. Springfield, IL: Charles Thomas.

"BFI Cleaning Up Toxic Oil Used to Pave Texas Roads." 1979. Solid Waste Management/Refuse Removal Journal, 27(June):8.

Blodgett, K.D., et al. 1983. Distribution of Toxicity in the Sediments of the Illinois Waterway. Illinois Department of Energy and Natural Resources, Document Number 84/06. Springfield, IL.

Borzo, G. 1986. "Cutting Weed Control Programs Instead of Weeds." Modern Railroads, 41(10):45-47.

Brandt, A.D. 1947. Industrial Health Engineering. New York: Wiley and Sons.

Brown, J.L. 1980. "Earthworks and Industrial Archeology." IA: The Journal of the Society for Industrial Archeology, 6:1-8.

Butterfield, W.J.A. 1896. Gas Manufacture. London: Griffith and Company.

"Bysulox Weed Killer." 1943. Railway Age, 114(March 20):588-89.

Carpenter L.V., E.W. Klinger, and G.R. Pyler. 1934. "Effects of Road Oils and Tars on Public Water Supplies." Journal of the American Water Works Association, 27(2):235-47.

"Chemical Killing of Weeds in Railway Track." 1923. Engineering & Contracting, 48(March 21):679-80.

"Chemical Killing of Weeds on Railway Roadbeds." 1922. Engineering & Contracting, 46(June 21):592.

Clemmer, H.F. 1923. "Field Experiments in Earth Road Oiling in Illinois." Municipal and County Engineering, 64(March):100-101.

Clemmer, H.F., and F.L. Sperry. 1924. "Illinois Oiled Roads Give Useful Data." Engineering News-Record, 92(March 13):446-47.

Collier, H.W. 1941. Outlines of Industrial Medical Practice. Baltimore, MD: Williams and Wilkins.

Cutter, S.L., and W.D. Solecki. 1989. "The National Pattern of Airborne Toxic Releases." The Professional Geographer, 41(2):149-61.

Davignon, I.F., J. St. Pierre, and G. Charest. 1965. "A Study of the Chronic Effects of Insecticides in Man." Canadian Medical Association Journal, 92:592-602.

"Developments in Asbestos-Asphalt Paving Mixes." 1960. Public Works, 91 (May):145.

Dove, A.K., and A.J. Peart. 1971. "Acute Toxicities of Arsenical Herbicides." Clinical Toxicology, 4:343-55.

Dunlap, T.P. 1978. "The Triumph of Chemical Pesticides in Insect Control, 1890-1920." Environmental Review, 2:38-47.

"Dust Treatment with Oil and Calcium Chloride." 1932. Public Works, 63(7):34.

Edwards, C.A. 1973. Environmental Pollution by Pesticides. New York: Plenum Press.

"The Effect of Road Tars on Water Supplies." 1933. Water Works and Sewage, 80 (November):408-10.

Fagerlind, C.C. 1952. "Street Oiling Program Pleases Public." Public Works, 83(September):56-58.

Findlay, A. 1917. The Treasures of Coal Tar. New York: Van Nostrand.

Flemal, R.C., ed. 1980. Sediment Pollution in Illinois: A Report on Problems and Causes. Illinois Water Information System, Report No. 26.

Freedberg, L. 1983. America's Poisoned Playgrounds: Children and Toxic Chemicals. New York: Youth News.

"Further Knowledge Being Gained on Action of Chemical Herbicides." 1952. Chemical and Engineering News, 30(39):4030-31.

Gold, B., et al. 1984. Technological Progress and Industrial Leadership in the U.S. Iron and Steel Industry, 1900-1970. Washington, DC: Lexington Press.

Goldman, A. 1984. "Controlling PCBs." In Perilous Progress: Managing the Hazards of Technology, edited by R.W. Kates, C. Hohenemser, and J.X. Kasperson, Boulder, CO: Westview Press, 345-70.

Green, M.B. 1976. Pesticides Boon or Bain? Boulder, CO: Westview Press.

Guenzi, W.D. 1974. Pesticides in Soil and Water. Madison, WI: Soil Scientific Society of America.

Hamilton, A. 1925. Industrial Poisons in the United States. New York: McMillan.

Haynes, W. 1945-1954. American Chemical Industry, Vol.1, Background and Beginnings: 1609-1911; Vol. 2-3, The World War I Period: 1912-1922; Vol. 4, The Merger Era: 1923-1927; Vol. 5, The Decade of New Products: 1930-1939; Vol. 6, The Chemical Companies. New York: D. Van Nostrand Company.

Hernandez, T.J. 1977. "Weed Control on Railways." Railway Engineer, 2(2):44-45.

Honchar, M.S. 1982. Health Hazard Evaluation Report: Long Island Railroad, New York. National Institute for Occupational Safety and Health. HETA 80-039-1179. Cincinnati, OH.

Huber, W. 1917. "Important Details in Oiling and Tarring." Good Roads, 13 (April 14):225-27.

Huffman, T.S. 1983. "Kell v. Appalachian Power Company: Aerial Application of Herbicides on Utility Right-of-Ways." West Virginia Law Review, 85:995-1002.

Humphrey, N., and T. Menzies. 1990. "Accidents Waiting to Happen: Beware of Those Old Oil and Gas Pipelines." Planning, 56(1):22-23.

Hutchinson, J.W. 1957. "Dust Control by the Use of Salt, Calcium Chloride and Bituminous Materials." Public Works, 88(December):112-14.

Illinois State Geologic Survey and Illinois State Water Survey. 1990. An Evaluation of the Impact of Pesticides on Groundwater in Illinois: Report to the Illinois Legislature. Champaign, IL.

Kimery, A.L. 1987. "Weed Killer." The Progressive, 51(July):21.

Kunze, G.W. 1966. "Pesticides and Their Effects on Soils and Water." Soil Science of America, 8:53-54.

Lichtenstein, E.P. 1965. "Persistence and Behavior of Pesticidal Residues in Soils." Archaeology of Environmental Health, 10:825-26.

Luh, M.D., R.A. Baker, and D.E. Henley. 1973. "Arsenic Analysis and Toxicity: A Review." Science of the Total Environment, 2:1-12.

MacIntyre, A.A. 1987. "Why Pesticides Received Extensive Use in America: A Political Economy of Agricultural Pest Management to 1970." Natural Resources Journal, 27:533-78.

Martin, G.E. 1934. "Developments and Present-day Practices in the Use of Tar." Public Works, 65(March):22-23.

Mathews, J.M. 1921. Bleaching and Related Processes. New York: Chemical Catalog Company.

Metcalf, R.L., and J.R. Sanborn. 1975. Pesticides and Environmental Quality in Illinois. Illinois Department of Registration and Education, Natural History Survey Division. Springfield, IL.

Miles, F. 1925. The Manufacture of Sulphuric Acid. London: Gurney and Jackson.

Millington, J.P. 1911. Modern Industrial Chemistry. Berlin: Franz Siemenroth.

Nauth, R. 1947. The Chemistry and Technology of Plastics. New York: Reinhold Press.

"Oil Field Brine Used on Highways." 1936. Mass Transportation, 32(July):211.

Osmun, J.V. 1980. "Vegetation Control: The State of the Art." Railway Track and Structures, 76(2):18-19.

Page, L.W. 1914. "The Use of Petroleum in Dust Prevention and Road Preservation." Bulletin of the American Institute of Mining Engineers, 86(February):708-15.

Pionke, H.B., and G. Chesters. 1973. "Pesticide Sediment - Water Interactions." Journal of Environmental Quality, 2:29-45.

Price, G.M. 1914. The Modern Factory. New York: Wiley.

Reed, J.H. 1924. "Oiled Earth Roads in Illinois." Municipal and County Engineering, 66(March):141-43.

"Road Oils, Specifications, Costs of Road Oiling." 1932. National Petroleum News, 24(August 10):25-64.

Russell, S.S. 1949. "Chemical Weed Killers Bring Better Right-of-Way Maintenance." Electrical World, 131(March 12):110-11, 193.

Sofranko, A.J. 1973. "Illinois Agriculture: The Changing Scene." Illinois Research, 15(4):3-5.

"Soil Contamination Spreads from Chemicals in Road Oil." 1979. Engineering News-Record, 202(May 17):20.

"Surface Oiling of City Streets." 1915. Municipal Journal, 38(March 13):653-54.

Tiney, B.C. 1938. "Important Details in Stabilization with Calcium Chloride." Public Works, 69(January):22.

Truesdell, P. 1933. "The Time is Ripe to Push a Road Oiling Program for Farm-to-Market Roads." National Petroleum News, 25(January 11):23-25.

U. S. Environmental Protection Agency, Office of Wastes Programs, Applied Technology Division, Rural Wastes Branch. 1972a. The Movement and Impact of Pesticides Used in Forest Management on the Aquatic Environment and Ecosystem. Pesticide Study Series No. 7. Washington, DC.

_____. 1972b. The Pollution Potential in Pesticide Manufacturing. Pesticide Study Series No. 5. Washington, DC.

_____. 1972c. The Use of Pesticides in Suburban Homes and Gardens and Their Impact on the Aquatic Environment. Pesticide Study Series No. 2. Washington, DC.

U. S. Environmental Protection Agency, Office of Water Programs, Applied Technology Division, Rural Wastes Branch. 1972. Development of a Case Study of the Total Effect of Pesticides in the Environment, Non-Irrigated Crop Lands of the Mid-West. Pesticide Study Series No. 4. Washington, DC.

U. S. Senate Committee on Environment and Public Works. 1987. Disposal of PCB Contaminated Liquids by the Texas Eastern Gas Pipeline Company. Hearing Before the Subcommittee on Superfund and Environmental Oversight; S. Hrg. 100-53. 100th Cong. 1st Sess., March 17. Washington, DC.

"Vegetation Control: Turbulent Years Ahead." 1981. Railway Track and Structures, 77(2):24-25.

"Vegetarian Killer: Household Borax is Found Effective in Denuding Roadbeds of Railroad." 1944. Business Week, (January 29):89-90.

Wauchope, R.D. 1978. "The Pesticide Content of Surface Water Draining From Agricultural Fields, A Review." Journal of Environmental Quality, 26:459-71.

Whorton, J. 1974. Before Silent Spring: Pesticides and Public Health in Pre-DDT America. Princeton, NJ: Princeton University Press.

Williamson, H.F., et al. 1963. The American Petroleum Industry: Volume II, The Age of Energy, 1899-1959. Evanston, IL: Northwestern University Press.

Willis, G.H., and R.A. Hamilton. 1973. "Agricultural Chemicals in Surface Runoff, Groundwater and Soils." Journal of Environmental Quality, 21:463-66.

Zeigler, D.J., Johnson, J.H., and S.D. Brunn. 1983. Technological Hazards. Association of American Geographers, Resource Publication in Geography, No. 2. Washington, DC.

Allvine, F.C., and J.M. Patterson. 1972. Competition, LTD.: The Marketing of Gasoline. Bloomington, IN: Indiana University Press.

American Petroleum Institute. 1986. Gasoline Marketing in the United States Today. API Publication Number 1593, 2nd edition. Washington, DC: American Petroleum Institute.

_____. 1959. Petroleum Facts and Figures: Centennial Edition. New York: American Petroleum Institute.

_____. 1942. Petroleum-Industry Hearings Before the Temporary National Economic Committee. New York: American Petroleum Institute.

_____. 1935. American Petroleum Industry: A Survey of the Present Position of the Petroleum Industry and Its Outlook Toward the Future. New York: American Petroleum Institute.

_____. 1930. Oil. New York: American Petroleum Institute.

American Society of Planning Officials. 1973. The Design, Regulation, and Location of Service Stations. Planning Advisory Service, Report 293. Chicago: American Planning Association.

Bean, F.W. 1920. "Laying Out Drives for Service Stations: Installing Pumps and Tanks." National Petroleum News, 12(4):41-45.

_____. 1919. "Planning a Drive-In Filling Station." National Petroleum News, 11(October 22):35-42.

Bednar, B.A. 1990. "Underground Tank Management." School Business Affairs, 56(7):18-21.

Bermingham, R.P., and W.L. Taylor. 1988. "Considerations in Transfers of Real Estate with Underground Petroleum Storage Tanks." Natural Resources & Environment, 3(1):30, 51-52.

Brieger, H.E. 1986. "Lust and the Common Law: A Marriage of Necessity." Boston College of Environmental Affairs Law Review, 13(4):521-52.

Buono, A., and E.M. Packard. 1982. Delineation and Hydrologic Effects of a Gasoline Leak at Stovepipe Wells Hotel, Death Valley National Monument, California. U.S. Geological Survey, Water Resources Investigations 82-45, Washington, DC.

Chadd, C.M., and M.C. Bryant. 1988. "Environmental Protection Agency Regulation of Underground Storage Tanks." Environmental Control Law, 19(1):6-9.

Claus, J.R. 1969. Spatial Dynamics of Gasoline Service Stations. British Columbia Geographical Series, Number 10. Vancouver, Canada: Tantalus Research, Ltd.

Claus, J.R., and D.C. Rothwell. 1970. Gasoline Retailing: A Manual of Site Selection and Development. Vancouver, Canada: Tantalus Research, Ltd.

Cox, M.E. 1988. "Underground Storage Tanks and Leak Detection: The New Federal Requirements." Environmental Management Review, 10(Fourth Quarter):2-28.

Dalton, T.F. 1987. "Underground Tank Removal." Pollution Engineering, 9 (7):70-71.

deChazeau, M.G., and A.E. Kahn. 1959. Integration and Competition in the Petroleum Industry. Petroleum Monograph Series, Vol. 3. New Haven, CT: Yale University Press.

Dharmavaram, S., et al. 1989. "A Profile and Management of the U.S. Army's Underground Storage Tanks." Environmental Management, 13(3):333-38.

Edmond, M. 1972. "What Marketers Are Doing--Or Not Doing--About Closed Stations." National Petroleum News, 64(April):82-87.

Eklund, B. 1985. Detection of Hydrocarbons in Groundwater by Analysis of Shallow Soil Gas/Vapor: Final Report. Washington, DC: American Petroleum Institute, Environmental Affairs Department.

Fitzgerald, J.H. 1988. "Don't Let Corrosion Get Your Underground Tanks." Materials Performance: An Official Publication of the National Association of Corrosion Engineers, 27(4):36-40.

Fitzgerald, J.H., and J. Wagner. 1988. "The Corrosion Engineer Looks at the EPA Regulations for Underground Tanks." Paper Presented at Corrosion '88 Conference, St. Louis, Missouri, March 21-25.

Glasner, D. 1985. Politics, Prices, and Petroleum: The Political Economy of Energy. Cambridge, MA: Ballinger Publishing Co.

Gopnik, M. 1989. "Subterranean Saboteurs: Leaking Underground Storage Tanks." Re:Sources, 7(1):14-15.

Harrington, A.J. 1989. "Out of Sight, But Not Out of Mind: Underground Storage Tanks" The Wisconsin Lawyer, 62(April):16-17, 68-69.

Hayman, R. 1989. "HOTs: Underground Heating Oil Tanks Hold as Many Liabilities as Other USTs." Hazmat World, 2(3):54-56.

Henry, M.F. 1986. "Update on the Underground Leakage Problem." Fire Journal, 80(2):26-27, 86.

Hogarty, T.F. 1981. The Origin and Evolution of Gasoline Marketing. American Petroleum Institute Research Study #022. Washington, DC: American Petroleum Institute.

Hunter, J.T. 1960. "Locational Control of Gasoline Service Stations." Syracuse Law Review, 12(Fall):66-79.

Illinois Environmental Protection Agency, Division of Land Pollution Control. 1989. Guidance Manual for LUST Cleanups in Illinois. IEPA/LPC/89-263. Springfield, IL.

Illinois Environmental Protection Agency and Office of the State Fire Marshal. 1987. Report to the Legislature, June 30, 1987. Springfield, IL.

Italiano, M.L. 1987. Liability for Underground Storage Tanks. New York: Practising Law Institute.

Jakle, J.A. 1978. "The American Gasoline Station, 1920 to 1970." Journal of American Culture, 1(Spring):520-42.

Jakle, J.A., and R.L. Mattson. 1981. "The Evolution of a Commercial Strip." Journal of Cultural Geography, 1:12-25.

Johnston, D.A., and D.E. Jardine. 1989. Investigation into Methods and Costs for Disposal of Removed Underground Petroleum Storage Tanks and Associated Contents. Charlottetown, Prince Edward Island, Canada: P.E.I. Department of Environment.

Kerth, A.L. 1974. A New Life for the Abandoned Service Station. Massapequa Park, NY.

Knox, C.E. 1988. "What's Going on Down There?: Pervasive Groundwater Contamination Prompts New Cleanup Approaches." Science News, 134(23):362-65.

Kroon, D.H. 1988. "Integrity Assurance Program for Undergound Tank Systems." Materials Performance: An Official Publication of the National Association of Corrosion Engineers, 27(4):27-31.

Lamb, R.F. 1985. "Morphology and Vitality of Business Districts in Upstate New York Villages." Professional Geographer, 37(2):162-73.

Lieb, C.H. 1985. Main Street to Miracle Mile: American Roadside Architecture. Boston: Little, Brown and Company.

Lonberg-Holm, K. 1930. "The Gasoline Filling and Service Station." The Architectural Record, 67(6):561-83.

McLean, J.G., and R.W. Haigh. 1954. The Growth of Integrated Oil Companies. Elmsford, NY: Maxwell Reprint Company.

Marr, P., and F.A. Schoolmaster. 1988. "An Application of GIS to Monitoring Site Changes in Gasoline Service Stations and Underground Storage Tank Locations." Proceedings of the Third Annual GIS/LIS International Conference; November 30-December 2, 1988; San Antonio, TX. Vol. 2, 852-60.

Matis, J.R. 1971. "Petroleum Contamination of Ground Water in Maryland." In Proceedings of the National Ground Water Quality Symposium; August 25-27, 1971; Denver, CO. 57-61.

Nacht, S.H. 1987. "EPA Stance on USTs: A Review of Proposed Regulations." Materials Performance: An Official Publication of the National Association of Corrosion Engineers, 27(4):80-82.

National Petroleum News. 1986a. "API Criticizes as Flawed EPA Storage Tank Study." National Petroleum News, 78(9):31.

_____. 1986b. "EPA's '35%' Underground Tank Leak Report Draws Industry Fire." National Petroleum News, 78(8):29-30.

_____. 1986c. "Service Station Deactivations." National Petroleum News Factbook Issue, 78:116.

_____. 1969. "Money to be Made: The Oil Marketing Story, A Quick History of Oil Marketing." National Petroleum News, 62(2):111-30.

_____. 1928. "Oil Marketing Trends to More Stable Conditions, Survey Finds." National Petroleum News, 20(April 18):29-30.

New England Interstate Water Pollution Control Commission. 1985--. L.U.S.T. Line: A Report on Federal and State Programs to Control Leaking Underground Storage Tanks. Boston, MA.

New York Department of Environmental Conservation. 1983. Technology for the Storage of Hazardous Liquids: A State-of-the-Art Review. Albany, NY.

Norris, D.A. 1987. "Interstate Highway Exit Morphology: Non-Metropolitan Exit Commerce on I-75." The Professional Geographer, 39(1):23-32.

Platt, W.C. 1936. "Competition Invited by the Nature of the Oil Industry." National Petroleum News, 28(February 5):202-5.

Rapaport, D. 1989. "Clean Tank Sites: High Stakes Business." Hazardous Waste Management, 7(3):16-19.

Reifman, D.L., et al. 1989. "Federal Government Promulgates New Underground Storage Tank Regulations." Environmental Control Law, 19(2):1.

Rizzo, J.A., et al. 1989. Underground Storage Tank Management: A Practical Guide, Third Edition. Rockville, MD: Government Institutes, Inc.

Robinson, J.E., et al. 1988. Underground Storage Tank Disposal: Alternatives, Economics, and Environmental Costs. Virginia Water Resources Research Center, Virginia Polytechnic Institute and State University, Bulletin No. 160. Blacksburg, VA.

Sculle, K.A. 1981. "The Vernacular Gasoline Station: Examples from Illinois and Wisconsin." Journal of Cultural Geography, 1(Spring/Summer):56-73.

Smalley, J.C. 1986. "Underground Storage Tanks: Rest in Peace?" Fire Command, 53(3):40-42.

Smedley, P. 1989. "Why Scarce Loans for UST Upgrades Frustrate Marketers." National Petroleum News, 81(12):47-50.

Snow, A. 1985. "Groundwater Protection Starts Below the Surface." American City and County, 100(9):62-70.

Stocking, G.W. 1973. The Oil Industry and the Competitive System: A Study in Waste. Clifton, NJ: Augustus M. Kelley Publishers.

Tejada, S. 1984. "Invisible Threat, Invisible Resource: Underground Tanks Contaminate Groundwater." EPA Journal, 10(1):20-22.

U.S. Environmental Protection Agency. 1988a. Underground Storage Tanks Containing Petroleum--Financial Responsibility Requirements and State Program Approval Objective; Final Rule. 40 CFR Parts 280 and 281. Federal Register, Vol. 53, No. 207, October 26, 1988, Rules and Regulations. Washington, D.C.

_____. 1988b. Underground Storage Tanks: Technical Requirements and State Program Approval; Final Rule. 40 CFR Parts 280-281. Federal Register, Vol. 53, No. 185, Part II, September 23, 1988, Rules and Regulations. Washington, D.C.

_____. 1985. Notification Requirements for Owners of Underground Storage Tanks. 40 CFR Part 280. Federal Register, Vol. 50, No. 217, November 8, 1985, Rules and Regulations. Washington, D.C.

U.S. Environmental Protection Agency, Center for Environmental Research Information and Office of Drinking Water. 1985. Seminar Publication--Protection of Public Water Supplies from Ground-Water Contamination. Cincinnati, OH.

U.S. Environmental Protection Agency, Office of Pesticides and Toxic Substances. 1986. Underground Motor Fuel Storage Tanks: A National Survey, Volume 1 Technical Report. EPA 560/5-86-013. Washington, DC.

U.S. Environmental Protection Agency, Office of Research and Development. 1987. Processes Affecting Subsurface Transport of Leaking Underground Tank Fluids. Washington, DC.

U.S. Environmental Protection Agency, Office of Toxic Substances. 1984. More About Leaking Underground Storage Tanks: A Background Booklet for the Chemical Advisory. Washington, DC.

U.S. Environmental Protection Agency, Office of Underground Storage Tanks. 1988a. Dollars and Sense: A Summary of the Financial Responsibility Regulations for Underground Storage Tank Systems. EPA/530/UST-88/005. Washington, DC.

_____. 1988b. Leak Lookout: Using External Leak Detectors to Prevent Petroleum Contamination From Underground Storage Tanks. EPA/530/UST-88/006. Washington, DC.

_____. 1988c. Must for USTs: A Summary of the New Regulations for Underground Storage Tank Systems. EPA/530/UST-88/008. Washington, DC.

_____. 1988d. Oh No! Petroleum Leaks and Spills: What Do You Do? EPA/530/UST-88/004. Washington, D.C.

_____. 1987a. Designing and Installing Underground Storage Tanks Under the New Federal Law. Washington, DC.

_____. 1987b. Underground Storage Tank Corrective Action Technologies. EPA/625/6-87-015. Washington, DC.

_____. 1986. The Interim Prohibition: Guidance for Design and Installation of Underground Storage Tanks. EPA/530-SW-85-023. Washington, DC.

U. S. House of Representatives Committee on Government Operations. 1984. Superfund Oversight: Ground Water Contamination in Western Pennsylvania. A Hearing Before a Subcommittee of the Committee on Government Operations; 98th Congress, 1st Session; July 1, 1983; Washington, DC.

Varin, D.W. 1961. Gasoline Station Location and Design. American Society of Planning Officials, Planning Advisory Service Information Report No. 140. Chicago, IL.

Vieyra, D.I. 1979. An Architectural History of America's Gas Stations. New York: Macmillan Publishing Co.

Williams, D.E., and D.G. Wilder. 1971. "Gasoline Pollution of a Ground-Water Reservoir - A Case History." Proceedings of the National Ground Water Quality Symposium; August 25-27, 1971, Denver, CO, 50-56.

Wright, W.G. 1989. "Stopping the Leakage of Misinformation: A Brief Review of Underground Tank Issues." The Arkansas Lawyer, 23(4):139-143.